Pit and Quarry

SAND · GRAVEL · STONE
CEMENT · LIME · GYPSUM

June 1, 1926

Pit and Quarry

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Vol. 12 CHICAGO, ILL., JUNE 1, 1926 No. 5

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Pit and Quarry

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Ideals in Trade Associations

IDEALS in any field of activity embody highest values attainable. To attempt to realize them is apt to discourage rather than to assist a person; yet they have practical power as regulative principles. They give the right direction and should be regarded as limits rather than as objectives. They represent the best possible acvhievement. William James discusses an ideal in a manner applicable to the subject in hand.

"An ideal," he says, "must carry with it that sort of outlook, uplift, and brightness that go with all intellectual facts. Secondy, there must be novelty in an ideal—novelty at least for him whom the ideal grasps. Sodden routine is incompatible with ideality, although what is sodden routine for one person may be ideal novelty for another. This shows that there is nothing absolutely ideal; ideals are relative to the lives that entertain them."

Leaders in the non-metallic mineral industries are giving their though and energy to the successful attainment of the trade association ideal. Their efforts are motivated by an earnest desire to foster a spirit of progress and of wholesome competition that will prove to be increasingly beneficial. Men who aid in forward moving enterprises are prompted to do so by ideals. They are men of vision and imagination. They work for the success of the association because they have before them an ideal that is their inspiration. There is no "sodden routine" in their efforts but rather novelty, enthusiasm, "uplift and brightness."

Annual conventions of trade associations are indicative of the year's growth, but are not all there is to the organization. There is great pleasure and unquestioned benefit available for those who attend. They can scarcely realize how much hard work precedes the convention. Only because a few men have had ideals are the many members of the industry able to enjoy the numerous advantages of these annual meetings. The spirit of such leaders serves to solidify the organization; it makes possible a harmonious and profitable survey of the immediate future for which plans must be made.

Men are fundamentally individualists; they think in terms of self interest. Associations function in terms of group interest. They represent the group idea expressing coordination in terms of the whole. Men recognize the necessity of the group idea and organize associations. The function of the association is to do what the individual cannot accomplish alone. In order to succeed in this attainment there must be a certain subjection of the individual to conform with group ideals. This calls for unselfish devotion to the best interests of the group as a whole. If carried too far this subordination of the individual would hamper his development and stifle his imagination. If the principle of subordination is ignored, there develops a top heavy, clumsy, unwieldy organization which is crushed by its own weight.

If the group idea is to function satisfactorily, the members of the association must have confidence in the leaders and faith in the industry. They must be desirous of maintaining harmony and of contributing to progress. The paramount interest of the group is in the general welfare of the industry and the elimination of just causes of dissatisfaction. The primary relation of the group to the individual is that of assistance and cooperation in working out his line of conformance to the requirements of group benefit. Another function of the group is to correlate the results of individual effort to the solution of the common problems. Success in reaching these ideals lies in the wisdom of the leaders and the confidence of the members of the association.

The real aim of a trade association is to seek solutions of problems of mutual interest. It must operate for the benefit of the whole without interfering with individual freedom. It occupies a somewhat precarious position in its relation to the individual and to the whole. The individual expects to gain something from the association and may become dissatisfied if he is disappointed. It is the business of the association to convince the individual that he gains if there is a general gain. It requires vision to accept the theory that only through a general prosperity can the individual prosper.

The strength of the association rests with its members; its labors are dependent upon their cooperation. If it is to be of greatest possible value to the industry, it must receive the support of the individuals. The possibilities of what may be accomplished through trade associations are unlimited; the possibilities of weakness and of failure are equally great. The leaders cannot take the place of the membership, nor can the members be served effectively without leaders. Without organization there will be no future of consequence for any association; without leaders there will be no organization; without individual support there will be no leaders.

Breaking Into Your Local Paper

COMPARATIVELY few producers have fully realized the value of the right kind of free newspaper space nor the really unusual opportunities for news and special articles that arise in their business at regular intervals.

Most editors are anxious to receive information concerning anything that appears to be news. Editors seek the unusual and anything that is unusual in your business offers a chance for publicity. Every producer should endeavor to tie his business up in a public press in such a manner as to place you and your business favorably in the public mind as often as the leader in his line.

There are certain broad classifications of local news which should always be borne in mind, such as robberies, accidents, fires, freak damage by storms or winds, unusual happenings such as large blasts, picnics, etc. A producer should not rely entirely upon only these happenings for his free newspaper space as they generally will not go very far. Something different now and then should be attempted.

One method is to watch the daily news, especially the general news that effects a large section of the county or concerns all of the people. Frequently in this general news you can figure out a connection with your own business and can pass out a special interview on this subject, which if interesting is very desirable. This is the very best kind of newspaper publicity because it establishes the producer as a leader in his field. People develop a faith in the individual who is frequently quoted by local editors. As an illustration of this point let me suggest that general news relating to building conditions throughout the country or road building programs offer a legitimate opportunity to any producer for an interview relative to conditions and prospects in his immediate section of the country.

It is of just as much value to have yourself mentioned or your picture published as it is to have your business noticed. If you become the father of twins, that is news of value when published in your local newspaper. If you win a local bowling tournament, do not hesitate to have the news passed along to the papers with your picture.

Another method of breaking into your paper involves the use of the straw ballot. If a local issue is live a poll of your employees on the matter, especially if the results are what are desired, frequently will be of news value.

Another news possibility which may result in tremendous good would be an article concerning the growth and development of your business, its effect upon the community, and its relation to national industry. Such an article can be illustrated with views of your plant and possibly be reinforced with a description of the processes of your operation.

The use of questionable methods in securing free publicity is, of course, not to be recommended. There are many legitimate ways in which the producer can bring his individual and company activities to the attention of the newspapers in an interesting manner. A little thought on this question will be worth while.

A Hundred Years in the Lime Industry

By F. A. Westbrook

REDDING, Connecticut, has been made immortal by the fact Mark Twain had his home there during the later years of his life. It is also interesting to lime producers because the Redding plant of the New England Lime Company is the oldest in the state. Lime burning has been carried on here for almost a hundred years.

The plant is situated in a beautiful little valley typical of the Connecticut hills; and through this valley runs the Danbury branch of the New Haven Railroad which has recently been electrified as a part of the single phase, high tension system which this railroad has installed between New York and New Haven.

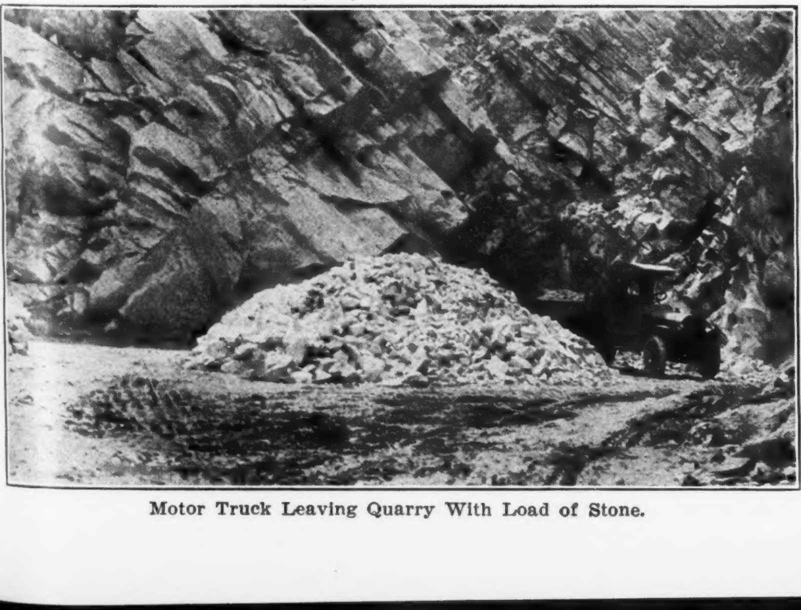
The quarry is a large one. That is, the workings cover a great deal of ground and are quite deep but the reason for this is mainly due to the number of years during which operations have been carried on, for the operation is on the whole a small one. There are only two kilns and the quarrying is in proportion.

As shown in the illustrations the rock formation is curious, being in rather thin strata at an angle of 45 degrees with the horizontal. This makes quarrying on the whole, rather easy. All operations are carried on by hand. This even includes drilling. The holes are naturally started with short drills and longer ones are employed as the hole becomes deeper. 40 per cent Dupont dynamite is used for blasting.

There are six men at work in the quarry. The stone is carried to the kilns in a Mack truck equipped with a Wood hydraulic hoist. Formerly, even until quite recently, horses and ox teams were used. The Wood hoist is a great convenience not only in dumping refuse on the waste pile or good stone in the storage space, but also in charging the kilns. As will be seen in the illustrations the roadways are built out to the tops of the kilns and it is an easy matter to back in the truck and discharge the load directly into them. Storage piles of stone are made as near as practicable to these so that the material may be readily made use of.

Wood is burned exclusively in one of the kilns and wood and coal in the other. The wood is purchased and, judging from the wooded character of the hills in this region, there should be no danger of the supply failing. A large amount is carried on hand. Coal of course is brought in over the railroad and the plant has its own spur for receiving its supplies and shipping its product.

The lime is shipped in both wood and steel barrels. The wood barrels



Motor Truck Leaving Quarry With Load of Stone.

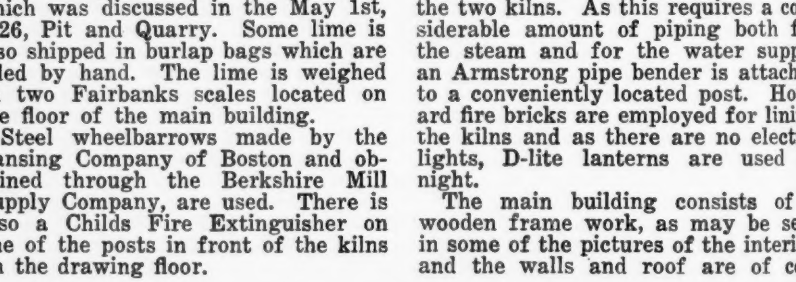
General View of Old Part of Quarry.

are made by hand in the cooperage shop and the steel barrels are made in the company's New Milford plant which was discussed in the May 1st, 1926, Pit and Quarry. Some lime is also shipped in burlap bags which are filled by hand. The lime is weighed on two Fairbanks scales located on the floor of the main building.

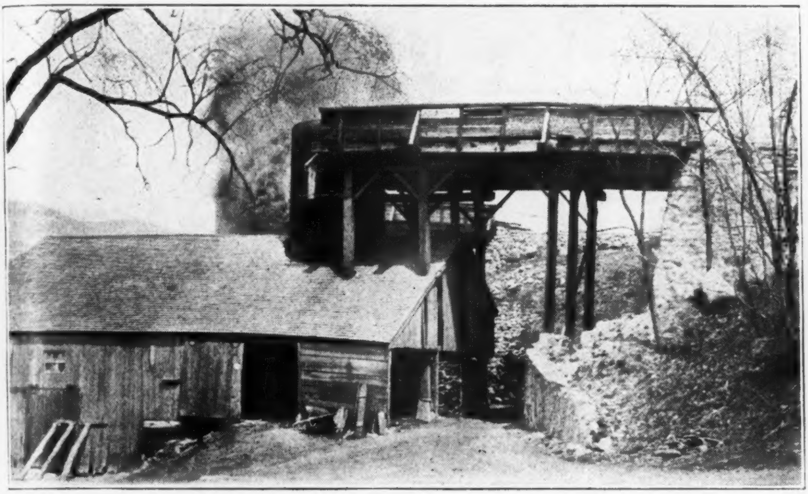
Steel wheelbarrows made by the Lansing Company of Boston and obtained through the Berkshire Mill Supply Company, are used. There is also a Childs Fire Extinguisher on one of the posts in front of the kilns on the drawing floor.

A small vertical boiler is used to supply steam to the kilns. This is located in the drawing floor between the two kilns. As this requires a considerable amount of piping both for the steam and for the water supply an Armstrong pipe bender is attached to a conveniently located post. Howard fire bricks are employed for lining the kilns and as there are no electric lights, D-lite lanterns are used at night.

The main building consists of a wooden frame work, as may be seen in some of the pictures of the interior, and the walls and roof are of cor-



Active Part of the Quarry.



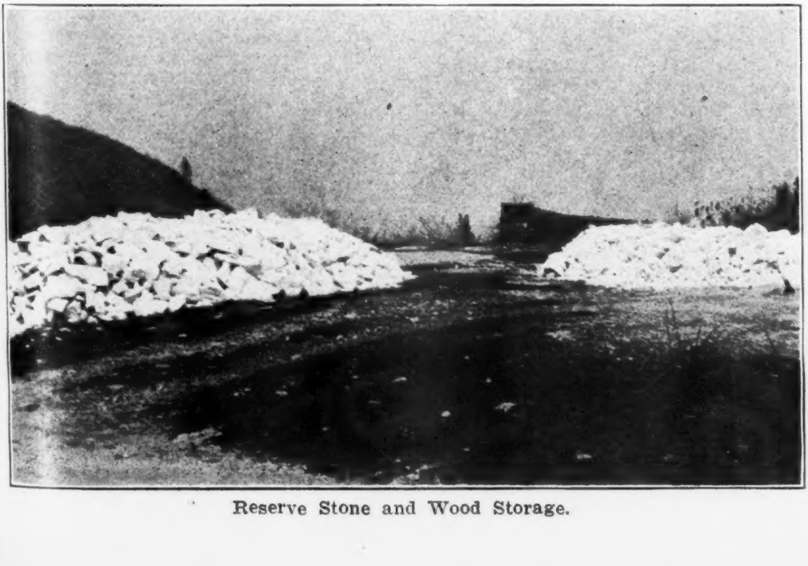
Bridge From Road to Top of Kilns.

rugated galvanized Apollo sheathing made by the American Sheet and Metal Roofing Company.

Four men, two on each shift, care for the firing of the kilns and for drawing and barrelling the lime. These, together with the six men in the quarry and one or two helpers for handling coal and wood and doing miscellaneous work, turn out 80 to 90 barrels of lime per day.

Although this is a small scale operation at present the property covers 100 acres and, being located on the railroad with good markets in such important industrial centers as New Haven, Bridgeport and others within 25 to 50 miles, there seems to be but little reason why this should not some day become very important.

It is a very interesting plant to see in comparison to many others because there is no machinery and because everything is done by hand. In spite of the fact that the plant is actually located perhaps unusually close to important industrial centers, the country hereabouts is so sparsely settled and the valley appears to be in such a state of natural beauty with only occasional farms scattered through it that it created a feeling of



Reserve Stone and Wood Storage.

Cooling Floor, Note Wood and Steel Barrels.

greater remoteness than many plants in the northern parts of Vermont. Until the railroad was electrified this year there was no electrical power line in this vicinity. Nevertheless William Hess, the superintendent, produces lime at a cost which compares favorably with many other operations of the New England Lime Company. It shows what can be done in a small, efficient and well managed operation.

The Krumroy Washing Gravel Co., Cleveland, Ohio, capital $100,000. Incorporator: Fred Dethloff.

Koppel Co. Promotes A. K. Barner

A. K. Barner, formerly assistant sales manager of the Koppel Industrial Car and Equipment Company, has been made district manager of the Southern territory with offices in the Robert Fulton Bldg., Atlanta, Georgia. Mr. Barner has had a great many years of experience as a sales engineer in the transportation field, and brings to his new position a wealth of experience.

The Johnson-Hudson Gravel Company, Carrollton, Mo. (deal in gravel, sand and stone). Capital $60,000.

General View of Plant.

Some Thoughts on Lime Burning

By C. H. Sonntag

THE calcining of limestone is, in theory, a simple operation—merely heating it to such a temperature that the carbon dioxide and such moisture as may be present are completely driven off. If we started with chemically pure calcium carbonate, or a mixture of pure calcium and magnesium carbonates, and heated them in a container with which they would not react, the problem, from the purely operating side, would be much simplified. In the chemical laboratory we can do these things. We can precipitate the carbonates from solution, wash them free of impurities, and calcine them in a platinum crucible. We can not follow this procedure in commercial practice, and our departure from these simple conditions confronts us with the various manufacturing problems that perplex the lime manufacturer.

The Financial Viewpoint

In the laboratory we are not greatly concerned with the cost of apparatus for making an operation possible, nor with the time required for carrying it out. In a business run for profit these things are vital—more so than many who ought to know, realize—and may make or break the enterprise. To particularize, a large part of the first cost of a complete lime plant is that paid for the kilns. This investment, in order to be warranted, must justify itself by returning to the investor a fair interest on his money, must reimburse him for the insurance and taxes, and finally the original sum must be returned to the investor by the time the kilns it purchases are worn out, or have become obsolete due to advances in the art. These things are collectively known to accountants as burden, carrying charge, or overhead. In the case of a lime kiln this burden will seldom be less than 15 per cent annually and may be more. It is just as truly a part of the cost of manufacture as firebrick, fuel or labor, but with this difference, that when the investment is once made, the carrying charge goes on whether the plant operates or not, and the burden per unit of output is inversely proportional to the number of units produced.

Now it is apparent that if a kiln turns out 12 tons of burned lime daily, and another costing about the same amount makes 20 tons, the overhead per ton of the second kiln will be only 60 per cent of that for the first. If production can be brought to 24 tons per day the burden will be cut in two. Every operator knows what his kilns cost, and can easily figure the reduction in overhead, and hence in manufacturing cost, that would result from increasing the output per kiln. If to this could be added the saving due to an improved fuel ratio, which is frequently possible, the economy would be one well worth working for.

Factors Limiting Kiln Output

Several causes militate against increase in the rate at which lime can be calcined in a kiln, among them being

(1) The temperature to which the lime can be raised without overburning.
(2) The fluxing action and abrasive wear on the lining.
(3) The rate at which heat can be supplied to the kiln.
(4) The rate at which the stone can be made to absorb heat.

The burning of portland cement clinker has many points of resemblance to the calcining of lime. The problem of increasing kiln production has been encountered and solved in the cement business, just as it will ultimately be in the manufacture of lime. A treatment of lime burning from the cement maker's standpoint, and a few words on how the latter has increased the output of his kilns, may be of interest.

(1) Limiting the Calcining Temperature

It is a very difficult thing to overburn chemically pure calcium carbonate. Natural deposits of this substance are never pure, but contain free silica, clay or other forms of aluminum silicate, iron oxide and minor amounts of other compounds. Some of these, such as the silicates, are fusible at the highest temperature of the lime kiln. Others, such as free silica and iron oxide, at high temperatures form fusible compounds with lime. In either case heating above a certain point, depending on the nature and amount of the impurities, seems to cause the glass or slag resulting from their fusion to surround the particles of lime, possibly filling their pores, and preventing the ready access of water to their interior so that hydration is retarded.

In portland cement burning a similar limitation as to temperature exists. Too hot a kiln causes the "clinker" to become pasty and roll up into large balls. The remedy is not to cool the kiln down by shutting off fuel, but to increase the speed of the kiln or the size of the load, so as to usefully absorb all the heat generated. By speeding up the kiln the material remains in the burning zone a shorter time and so does not have opportunity to acquire an excessive temperature. By increasing the load there is more material present to absorb the heat, and so the temperature is held down to a safe value.

It is not possible to increase the volume of the load of a vertical lime kiln, since the shaft is already full. It is possible, however, to pass the stone more rapidly and at a more uniform rate through the kiln, and so make effective use of additional heat instead of letting it raise the temperature of the burning zone too high. Uniformity of passage through the kiln is obtainable by using an automatic discharge, such as a revolving table or reciprocating feeder, which will slowly but continuously withdraw burned lime from the bottom of the kiln, and so cause an equally continuous movement through the calcining zone. More rapid, as distinguished from more uniform passage through the kiln without the use of excessive temperatures to complete the calcination calls for a more rapid absorption of heat by the stone, and this will be taken up later.

(2) Fluxing and Wear of the Lining

The fire-brick commonly used for furnace and kiln linings, whether of ordinary fire clay or highly aluminous clay, is composed of materials that will form fusible compounds with lime if heated to a sufficiently high temperature. These compounds or slags when once formed melt at a lower temperature than the refractory itself, and their continuous formation will result in rapid erosion of the brick. This is aside from the abrasive action of the moving charge against the hot surface of the brick.

Fire-clay is not the only substance from which refractory brick can be made. The following, among others, would seem to offer possibilities for improvement in linings for the calcining zone:

Carborundum, an artificial compound of carbon and silicon.

Diaspore, one of the natural forms of hydrated alumina.

Chromite, natural chromium oxide, more or less impure.

Zirkite, the trade name of brick made from natural zirconium oxide.

Brick made from these substances are all more expensive than those made from fire-clay. Zirkite especially is quite costly, and is not produced on a manufacturing scale comparable with that of the others. The writer does not know that the calcining zones of lime kilns have been lined with any of these refractories, but they seem to offer a field for co-operative investigation with their manufacturers. The test of value is not the first cost of the brick, but the cost of a lining per ton of lime produced during its life, including in this cost the money value of the loss of time and production necessary to reline.

Another method of protecting the lining, taken from blast furnace practice, is the use of cooling plates or water jackets. In some non-ferrous smelting furnaces the fusion zone is entirely surrounded by a double shell through which water is circulated, the shell being lined with fire-brick. In other furnaces the cooling is by separate water-cooled panels embedded in the brick setting. In some designs it is possible to remove a burned-out panel without cooling or emptying the furnace.

Either of these devices will keep the outer surface of the brick so cool that fluxing can go on only to a limited extent, and must stop before the lining is entirely removed. Further failure should then be by abrasion of the moving charge.

(3) Rate of Heat Supply to the Kiln

The amount of fuel that can be burned in a given time in a kiln or in a furnace connected to it depends on the rate at which air for combustion can be supplied. This air is usually drawn in by the draft, sometimes aided by a steam-jet blower under the grate if a coal-fired furnace is used. Natural draft is determined by the height of the kiln, the average temperature of the column of ascending gases, and the obstruction offered by the stone in the kiln. These things once being fixed, a definite limit is set to the rate at which the kiln can be fired.

It seems to have been pretty well proven that in practice nothing is gained by increasing the height of the kiln beyond a certain point as long as the entire shaft is kept full of stone. However, a stack on top of the kiln will help the draft if it is large enough in diameter to pass the gases freely, and many kilns are so fitted. A more definite and more positively controlled draft may be had by sealing the top of the kiln by a bell and hopper such as is used on blast furnaces, and using an induced draft fan.

If the rate of combustion be increased without any other changes the kiln will get too hot, unless the charge can be passed through rapidly enough to make use of the additional heat.

(4) Rate of Heat Absorption by the Stone

It has already been suggested that better heat absorption would be brought about by continuous, rather than intermittent movement of the stone through the kiln. This would also lessen the danger of some pieces remaining in the hottest zone so long as to be overburned. But to increase the average rate of heat absorption it will be necessary to increase the average rate of flow of the charge, which means increasing the output, but which also means that any one piece of stone will stay a shorter time at the point of highest temperature.

It may be said that if the stone remains a shorter length of time in the calcining zone core will result, as the interior of the lumps will not have had an opportunity to reach the calcining temperature, or if this temperature is reached, it will not have been maintained long enough for complete dissociation. This same problem was encountered in the early days of making cement in rotary kilns, and the solution was found in finer grinding of the raw materials. Of course the feed of a vertical kiln can not be powdered, but it can be crushed to a smaller size, and if the average dimensions of the lumps be reduced by one half the time for the calcining temperature to reach their centers should be reduced by one half also.

The objection will be immediately and properly made that the smaller stone will obstruct the draft. A somewhat similar phenomenon occurs in rotary cement kiln practice. When forcing of a cement kiln is attempted by increasing the supplies of fuel and raw material, the fact is encountered that natural draft is not great enough to draw in the proper amount of air and remove the products of combustion. But when artificial induced draft is used, as it must be when waste heat boilers are installed, the production of a rotary kiln may be increased at least 30 per cent. In the iron blast furnace, which perhaps resembles a lime kiln more closely, forced draft permits the furnace to be fed with ore that is almost a powder. Granted that conditions are not exactly parallel, it does seem that induced draft offers the dual advantage of increasing the production of a lime kiln and at the same time permitting the use of stone that is too small for sufficient use with natural draft.

About 15 years ago, a method of burning gas known as "surface combustion" was made public. It consists in injecting into a granular mass of refractory, such as broken firebrick, a mixture of gas and air in almost theoretically correct proportions, the air being slightly in excess. Combustion is almost without flame, and appears to take place mostly on or close to the surfaces of the pieces of brick, which are soon raised to incandescence.

It is possible that combustion in gas-fired kilns goes on more or less in this way, the lime acting as the granular refractory. This method of combustion generates the heat just at the place where it is most wanted—that is, among the pieces of stone, and a careful study of it might result in a saving of fuel.

The matter of gas analysis will not be taken up, as it has been ably handled by other writers, but it will do no harm to repeat what has been said many times before—that every bit of air admitted to the kiln above the needs for perfect combustion will carry out at the top heat that should have been utilized in the interior of the kiln in doing the work of calcining.

Taylor Chain's New Catalog

The S. G. Taylor Chain Company have just issued a revised general catalog which contains complete data on safe loads for double sling chains when used at various angles.

Portland Cement Statistics for April

Production, shipments and stocks of finished Portland cement, by districts, in April, 1925 and 1926, and stocks in March, 1926, in barrels

(Last 000 omitted)

Commercial District	Production —April— 1925	Production —April— 1926	Shipments —April— 1925	Shipments —April— 1926	Stocks at —end of April— 1925	Stocks at —end of April— 1926	Stocks at end of March 1926
Eastern Pa., N. J. & Md.	3,337	3,258	3,808	3,679	4,571	5,311	5,732
New York	731	518	771	811	1,232	1,336	1,629
Ohio, Western Pa., & W. Va.	1,275	1,198	1,276	1,180	2,017	2,721	2,703
Michigan	868	762	865	610	1,326	1,932	1,780
Wis., Ill., Ind. & Ky.	1,957	1,413b	2,140	1,562b	3,555	3,817b	3,966
Va., Tenn., Ala., & Ga.	1,111	1,259	1,134	1,311	682	1,059	1,111
Eastern Mo., Ia., Minn. & S. Dak.	1,347	1,133	1,316	1,142	3,303	3,078	3,087
Western Mo., Neb., Kans. & Okla.	1,063	854	1,029	898	1,596	1,443	1,487
Texas	405	412	451	447	295	501	536
Colo. & Utah	224	219	217	202b	312	223b	206
California	1,096	1,009	1,090	958	521	552	501a
Ore., Wash. & Mont.	393	368	297	312	472	518	462
	13,807	12,403b	14,394	13,112b	19,882	22,491b	23,200a

a Revised. b Figures include estimate for one plant each in Indiana and Utah and are subject to revision.

Production, shipments and stocks of finished Portland cement, by months, in 1925 and 1926, in barrels

Month	Production 1925	Production 1926	Shipments 1925	Shipments 1926	Stock at end of month 1925	Stock at end of month 1926
January	8,856,000	7,887,000	5,162,000	5,672,000	17,656,000	20,582,000
February	8,255,000	7,731,000	6,015,000	5,820,000	19,897,000	a22,384,000
March	11,034,000	a10,355,000	10,279,000	a9,539,000	20,469,000	a23,200,000
1st quarter	28,145,000	a25,973,000	21,456,000	a21,031,000	....	....
April	13,807,000	b12,403,000	14,394,000	b13,112,000	a19,882,000	b22,491,000
May	15,503,000	....	16,735,000	....	18,440,000	....
June	15,387,000	....	17,501,000	....	16,409,000	....
2nd quarter	44,697,000	....	48,630,000	....	....	....
July	15,641,000	....	18,131,000	....	13,896,000	....
August	16,419,000	....	18,383,000	....	11,952,000	....
September	15,939,000	....	17,711,000	....	10,247,000	....
3rd quarter	47,999,000	....	54,225,000	....	....	....
October	15,992,000	....	15,309,000	....	10,979,000	....
November	13,656,000	....	10,187,000	....	14,534,000	....
December	10,713,000	....	6,917,000	....	18,365,000	....
4th quarter	40,361,000	....	32,413,000	....	....	....
	161,202,000	....	156,724,000	....	....	....

a Revised. b Includes estimate for two plants and subject to revision.

Imports and exports of hydraulic cement, by months, in 1925 and 1926

Month	Imports 1925 Barrels	Imports 1925 Value	Imports 1926 Barrels	Imports 1926 Value	Exports 1925 Barrels	Exports 1925 Value	Exports 1926 Barrels	Exports 1926 Value
January	231,258	$ 364,196	360,580	$576,717	71,596	$ 207,547	72,939	$216,431
February	119,077	206,308	314,118	527,948	56,249	181,356	73,975	220,706
March	218,048	337,039	493,241	812,968	65,248	200,410	69,080	205,647
April	197,686	280,826	(b)	(b)	89,508	263,831	(b)	(b)
May	186,897	286,959	......	....	85,385	250,845	......	......
June	254,937	409,539	......	....	71,343	217,899	......	......
July	335,118	499,602	......	....	98,141	286,543	......	......
August	379,847	611,551	......	....	103,961	289,904	......	......
September	513,252	789,121	......	....	102,649	285,225	......	......
October	535,050	824,268	......	....	73,369	228,467	......	......
November	388,604	678,518	......	....	101,825	294,201	......	......
December	295,548	526,001	......	....	100,323	296,900	......	......
	3,655,317	$5,813,928	......	....	1,019,597	$3,003,128	......	......

Domestic hydraulic cement shipped to Alaska, Hawaii and Porto Rico, in March, 1926*

	Barrels	Value
Alaska	522	$ 1,817
Hawaii	18,697	41,513
Porto Rico	5,005	11,560
	24,224	$54,890

*Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision. [b]Imports and exports in April, 1926, not available.

Automatic System in Lime Manufacture Results in Low Labor to Ton Ratio

By J. C. Schaffer

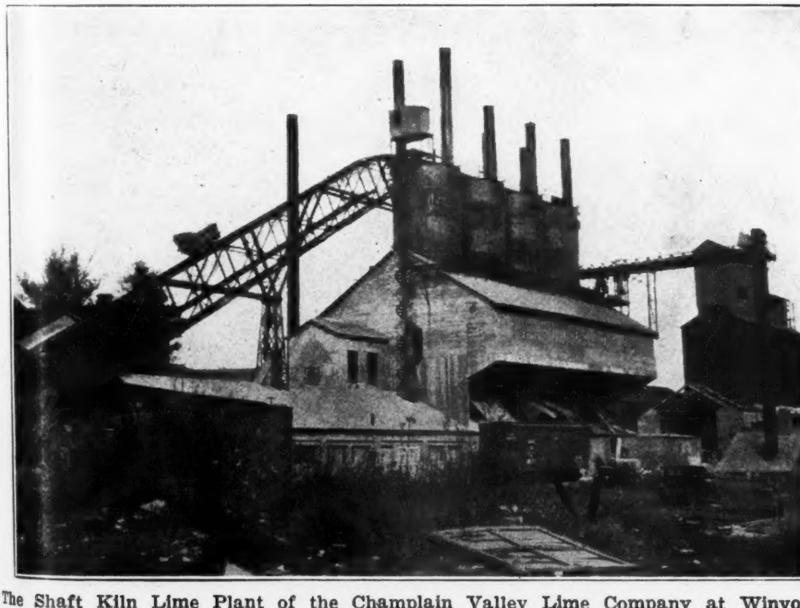
President and General Manager, Schaffer Engineering Company

A HIGHLY developed scientific method for the manufacture of lime has been developed and reduced to a simple operation in the new plant that is now nearing completion at Winooski, Vermont, by the Champlain Valley Lime Company. A portion of the plant has been in operation for the past year, and the recent perfection of certain portions of this plant has brought about results even greater than those which were expected by both the Champlain Valley Lime Company and the builders.

The plant is located just outside of Winooski, a suburb of Burlington, Vermont. At this point there is an exceptionally fine deposit of high calcium limestone, which has properties which give a very high quality lime for finish coat work and plaster work. The rock underlies a large acreage, and has a depth of several hundred feet, giving a supply of high class raw stone for many years to come. The rock is at present quarried by the bench system, and the quarry is being gradually deepened to a depth that will enable working both by the mining and open system.

The plant consists of a battery of four Schaffer automatic kilns with provision for four additional kilns in line, an oxide department with facilities for handling and shipping all classes of lime in the oxide form, and a hydrate department having a Schaffer super hydrator, a Raymond air separating system, and storages for two grades of hydrate lime, with direct connected Bates packers under these storages.

The plant is located so that the special Schaffer quarry cars are loaded and hoisted direct from the loading tracks over the tops of the kilns. A Lidgerwood 200 h.p. remote control hoist is used for hoisting the cars from the first kiln, and by means of a controller and foot pedal, he has full control of hoisting and stopping of the cars at any point. A special



The Shaft Kiln Lime Plant of the Champlain Valley Lime Company at Winvoski, Vermont.

Schaffer pull-back system automatically connects to the car at the top of the incline and gives the power for returning the quarry car from over the top of the kilns. The motor acts as a brake for the car returning down the incline, and enables the operator to control the speed of the car while descending. As the car returns from the horizontal track over the top of the kilns, the pull-back system is automatically disconnected and left in position for connecting the next car.

Built in with the tipple are new type Howe scales which weigh the cars on the incline. It is only necessary to stop the car on the scales for an instant to allow the hand on the scale dial to come to rest. These scales are so designed that they give the correct reading of the weight of the stone in the car and compensate for the angle and the pull of the rope.

The tipple is a unique special design, only having one intermediate support. One end rests on a concrete base, and the other attaches to the first kiln, which stands 90 feet above the level of the railroad track. Directly under this tipple is located a concrete building which houses the hoist, boiler for furnishing steam to the kilns, air compressor, blacksmith shop, and supply room. The boiler is a 150 h.p. Wickes vertical water-tube boiler, equipped with a McClave feed hopper and furnace. Attached to this boiler is an emergency Westinghouse locomotive air compressor. Circular stairs lead from this same building to the firing floor and to the top of the kilns, giving quick access to both points.

The Schaffer automatic shaft kiln is the result of ten years of experimental work, research work, and development, incurring an expenditure of more than $100,000. This kiln embodies many new features and carefully worked out points in every detail. The kilns are 17 feet 3 inches in diameter and stand 90 feet high. They have a pre-heating and assidulating section, a fireless calcining section, and cooling section. The Schaffer kiln when full has the equivalent of 376 tons of stone in the process of manufacture. The interior is of unusual shape, and different from that of any other kiln. There is embodied in the interior construction of the kiln a unique flue arrangement which gives these kilns a high draft even though they carry an exceptional quantity of raw stone in the top.

These kilns are equipped with specially designed stokers which are automatically operated by a clock, which gives an interval operation assimilating that of hand firing. These

The Storage and Packing Plant.

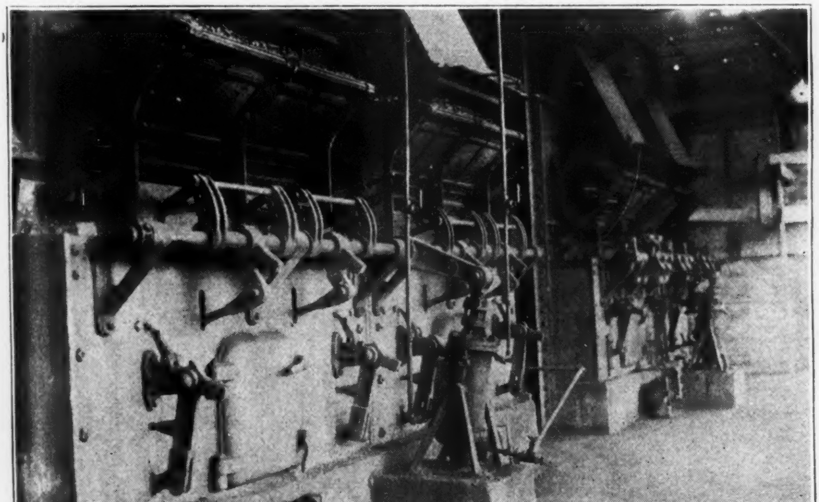
stokers are fit into a specially designed furnace having certain proportions and relations to the interior of the kiln, and in such a way that all conditions are under control and easily balanced. The stokers and the furnaces were the most difficult part of the kiln to develop so as to give proper flame for producing a soft burned lime in large quantities and with the highest efficiency, and at the same time obtain an operation that would give constant conditions without highly skilled operators.

The natural tendency of a stoker is to give the reverse conditions desired for calcining lime, and after trying many different types of stokers, it was found necessary to develop a stoker on different principles entirely of those in common use before a successful automatic operation could be obtained. The result of this is a flame that can be controlled for the maximum temperature it will produce at any given point, and a gradual heat treating condition from the eyes to the top of the kiln, which gives the raw stone an exceptionally gradual treatment in its course down through the kiln and a gradual cooling condition from the eyes to the draw shears. This operation gives a higher quality lime using slack coal as fuel than that produced from the same rock with wood as fuel in their old operation.

The stone is fed into these kilns through openings in the top, which have special doors for closing the tops of these kilns tight. The lime is drawn from the bottom of the kilns at intervals of three to four hours by means of a special shaped draw shear operated by air cylinders which are controlled by a valve located close to the inspection doors. The Schaffer kiln is known as the only successful slip kiln in existence, and when the shears are opened, the lime moves evenly throughout the kiln, and the whole operation of drawing requires usually less than five minutes.

A carefully conducted check on these kilns over a period of eleven days showed an average daily capacity of high calcium lime of 41 tons. They showed a fuel ratio on this same test of 6 pounds of lime to 1 pound of coal having a fuel value of 13,000 B.T.U's. The average core did not exceed 400 pounds per day.

The lime from the kilns when drawing is discharged onto a floor that has movable sections, under which there is a specially designed hopper and double conveyor. The lime is sorted on this floor and the number 1 quality is dropped into the hopper over the one side of the conveyor and the number 2 quality is fed into the other side. The lime as it comes from the kiln is sufficiently cool to be handled and



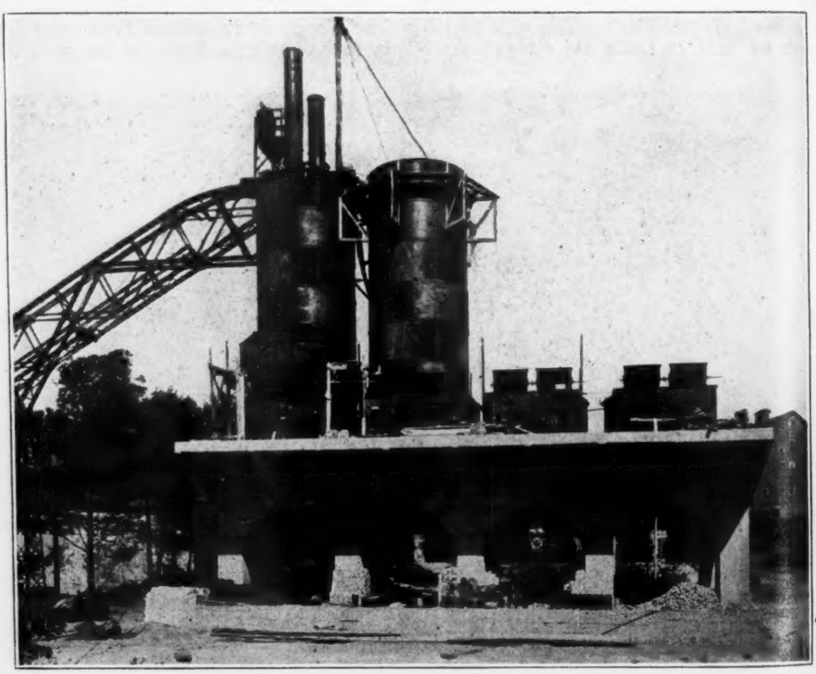
The Improved Automatic Stoker.

sorted immediately. This conveyor carries the lime to a Pennsylvania single roll crusher, which receives the lime from both sides of the double conveyor, keeping it separate, and discharges it into a specially designed double elevator. This elevator carries the two qualities of lime and discharges the lime onto a Schaffer screen, which separates the fine from the lump and discharges the fines of each quality into separate compartments of the bunker, and the lump lime of each quality into their respective compartments of the storage bunker.

The oxide of quick lime storage bunker consists of eight compartments, with a total storage capacity of 2,500 tons. Under this storage bunker there is connected a Webster pan conveyor for carrying either grade of crushed lump lime out and delivering it into a Manierre box car loader. The railroad car rests on track scales at this point, and when the correct amount is loaded into the car, the scale beam makes contact with an electric bell which signals the operator that the correct amount is loaded in the car. By this arrangement a car of lime is loaded in 30 to 40 minutes with one man.

For placing crushed lump lime in barrels there are provided under the lime bunkers specially designed spouts with a gate arrangement, which permit filling a barrel in three seconds. These barrels rest on platform scales depressed in the floor and the scale beam is directly in front of the man filling the barrels so that the correct amount can readily be gauged in each barrel. When the barrels are filled, they are removed, headed, and nailed, ready to be loaded into cars.

A special pan feeder is located directly under the center of the crushed lump lime compartments with a gate arrangement which permits drawing and feeding an even amount of either grade of lump lime into a Pennsylvania hammer mill. The fine lime is likewise fed from the respective compartments by the same feeder at different periods into this hammer mill. The hammer mill reduces the lime to a fine state and discharges it into an elevator which carries it up and discharges it onto a Hummer screen equipped for separating the lime into three sizes, the oversize returning to the hammer mill, the fine size into one compartment, and a coarser size with the fines out into another compartment. There are two compart-



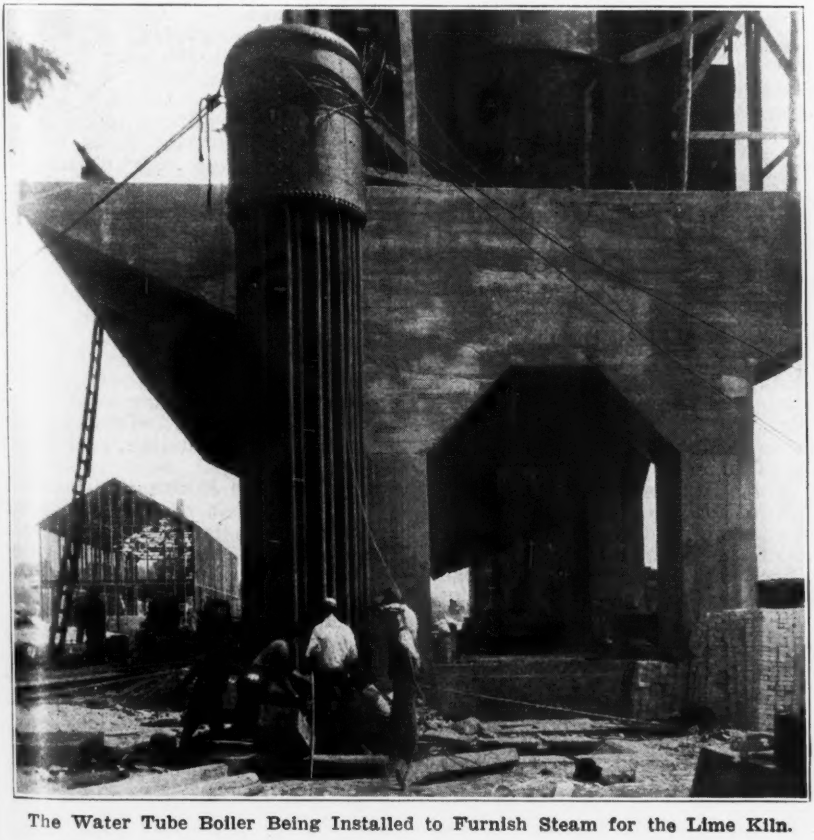
View Taken During Construction of the Plant.

ments for the number 1 grade lime and two compartments for the number 2 grade.

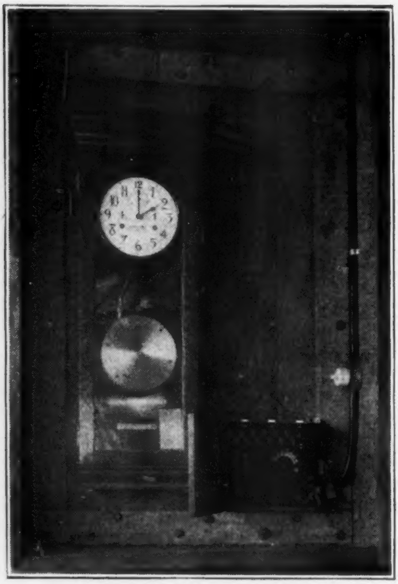
Under these compartments there are located four Howe barrel packers which fill the barrels with either grade of finely divided lime, with the correct amount in each, after which they are headed, nailed, and loaded into cars. Under the center of these compartments there are located special Schaffer feeders, which are provided with gates for drawing the lime from any of the four compartments and delivering it into an elevator that carries it up and puts it into box cars for shipping in bulk, or direct to a Schaffer super number 1 hydrator.

The hydrator is equipped with a special automatic hopper which governs the feed of the lime from the bunker to the Schaffer poidometer, which feeds the lime and water in correct proportion into the hydrator. This hydrator has a capacity of 15 to 20 tons of hydrate lime per hour, at the same time giving the lime a scientific treatment in hydrating that develops the properties to a high degree. From the hydrator the lime is delivered into two number 3 special Raymond air separating mills, which separate the impurities and deliver the lime into two storage tanks having a capacity of 250 tons each.

Under each one of these storages there is a direct connected Bates valve bag packer, which automatically places the correct amount of hydrate lime into each bag at the rate of 80 tons per hour. Directly under these bagging machines there is a grating and a Schaffer special spillage reclaiming system. The spillage from the bagging machine drops through the grating into air pipes, which carry the lime back up into the respective storage bunkers. The railroad siding is located alongside of the plant, which gives exceptionally convenient loading conditions for all of the different products from the plant.



The Water Tube Boiler Being Installed to Furnish Steam for the Lime Kiln.



Clock Which Controls the Automatic Stokers.

Outside of the labor required for operating the quarry, there is one man required for hoisting and dumping the stone into the kilns. Another man is required for looking after the boiler, pumps, and air compressor, day and night shift. There are required two men and a superintendent of operation for operating the four kilns each shift. Due to the close sorting of the number 1 grade lime, there are required two men per kiln, day shift, for sorting and feeding the lime into the double conveyor under the kilns. In the oxide or quick lime department one man is required part time to load crushed lump lime into cars. Two men are required for packing crushed lump lime into barrels and two headers and nailers. Two men and two headers and nailers take care of the packing and shipping of the finely divided product. Three men truck and load the barreled lime into cars. One man operates the hydrate department. The bagging department requires two men on bagging machines and two truckers and two loaders. One foreman is required for the oxide department and the hydrate department. One mechanic is required for looking after the machinery of all of the departments and oiling same. It requires the time of one man three hours for dumping cars on the coal storage tipple and operating the machinery for delivering the coal up into the bunkers over the furnaces of the kilns. The balance of his time is occupied in cleaning up and placing cars for loading.

The above number of men handle the production of four kilns producing 160 tons of lime per day, or, in other words, a total of 30 to 35 men including the superintendent if they were all to be occupied regularly at the different operations, but as some of these operations will not be continuous, the above amount of men is not used daily for the capacity of the four kilns, only during a peak in shipping. This plant operates with the lowest ratio of labor to tons capacity due to the unique and automatic features of the plant throughout.

Yellow Strand Golden Jubilee

"The Yellow Strand," house organ of the Broderick and Bascom Rope Company, is issued in especially attractive form for May in honor of the fiftieth anniversary of the concern's birth. On the very first, page by way of introduction, the editor announced the publication will break a precedent and neither moralize nor philosophize upon the firms achievements, dropping sage observations from the heights.

"We have climed steadily up the Mountain of Progress for 50 years," the editor says. "But we have not reached the pinnacle of achievement. Fifty years ago the Mountain of Progress was a mere hillock. Today it rises to a superb altitude. Tomorrow it will rear itself to still greater heights. To climb with industry is far more to our liking than to sit on the Pinnacle of Achievement and let the growing Mountain of Progress overwhelm us."

He then goes on to promise that he will tell the tale of fifty years and start at the beginning. The story of fifty years is both interesting and well told.

Weigel to Handle Non-Metallics

W. M. Weigel, mineral technologist, has been designated specialist for the division of Mineral Resources and Statistics, Bureau of Mines, on the following subjects: sand and gravel, silica, talc and soapstone, and the fertilizer materials phosphate rock, potash and nitrates. Mr. Weigel will write the separate chapters of "Mineral Resources of the United States" devoted to these materials.

First Principles of Combustion

By Charles Longenecker

THE men held accountable for the economical production of lime from kilns are essentially, what has been termed "practical men." They deal in facts not in theories. Volumes can be written on "how" to fire and operate kilns but very frequently there is a very wide gap between practice and theory. Some elemental factors governing combustion have been proved and, while of a theoretical nature, will, when understood, make clear the underlying principles controlling the burning of fuels. As coal is burned in most all types of kilns it only will be considered.

Coal is analyzed either by what is termed the "proximate" or "ultimate" method. Analysis of the same coal under these two headings follows:

ULTIMATE

Carbon	79.86
Hydrogen	5.02
Oxygen	4.27
Nitrogen	1.86
Sulphur	1.18
Ash	7.81
	100.00

PROXIMATE

Fixed Carbon	62.64
Volatile Matter	29.55
Moisture	2.90
Ash	7.81
	102.90

When purchasing coal both of these analyses should be demanded as it is impossible to appraise a coal without the information they afford. The fusing point of the ash should also be known. The Ultimate analysis gives the percentage of the several elements of which the coal is composed and is of value as from it the heat units per pound of dry coal can be calculated by the following formula:

$$14{,}600\ C + 62{,}000\ (H - \frac{0}{8}) + 4{,}000\ S =$$

B. T. U.'s

In this formula the letters C, H, O, and S represent the percentage of Carbon, Hydrogen Oxygen and Sulphur as given in the Ultimate analysis. The expression B. T. U. is that quantity of heat required to raise one pound of water one degree fahrenheit. The heat content of coals is always expressed in B. T. U's.

Substituting the values given in the analysis is above formula $14{,}600 \times .7986 + 62{,}000\ (.0502 - \frac{.0427}{8} + 4{,}000 \times .0118\ 11{,}660 + 2{,}784 + 47 =$ 14,491 B. T. U. per pound of coal.

This result, while only an approximation, serves as a check on that secured by the calorimeter, which instrument is used as the standard. In the calorimeter the coal is actually burned and the heat liberated is measured by the rise in temperature expressed in degrees fahrenheit, of a known quantity of water. As the heat capacity of water is known it is a simple matter to calculate the heat set free. A thermometer records the rise in temperature.

By the Proximate analysis it is possible to ascertain the percentage of gases in the coal. This is expressed by the term "volatile matter" which as the name implies is that portion of the coal which volatilizes when it is heated. This "volatile matter" is made up of various gases, consisting of hydrogen and carbon and it is these elements which, when in large quantities, give a free burning, or easily ignited, coal.

The term "Fixed Carbon" represents the amount of carbon remaining after the volatile matter has been driven off. Coke is practically all "fixed carbon" with the ash included. As is the case with coke the "fixed carbon" is more difficult to ignite than raw coal from which the gaseous elements have not been driven off.

The combustible elements in any fuel are the carbon, hydrogen and the sulphur. These elements unite with the oxygen of the air and burn to carbon dioxide (CO_2), water (H_2O) and sulphur dioxide (SO_2). In some cases the carbon may only burn to carbon monoxide (CO) in which case less heat will be generated. The air, as mentioned above, supplies the oxygen but with this oxygen there is 3.35 times as much nitrogen as oxygen. This nitrogen performs no useful service but must be heated to the temperature of the waste gases. The amount of heat generated by one pound of the elements mentioned above is:

Hydrogen	62,000 B.T.U.
Carbon to Dioxide	14,550 B.T.U.
Carbon to Monoxide ..	4,450 B.T.U.
Sulphur to Dioxide ...	4,050 B.T.U.

In burning coal the gases are driven off first and these, containing the hydrocarbons, must meet sufficient oxygen to burn completely. The "fixed carbon" remaining can be burned on the grate bars with the assurance of being completely consumed if the proper attention is given.

There are several fundamental equations which illustrate the process of combustion. These will be discussed with the idea of showing the bearing of theory on practice.

Carbon burns to carbon dioxide according to the following equation $C + O_2 = CO_2$. Here one pound of carbons combined with 2⅔ pounds of oxygen burns to 3⅔ pounds of carbon dioxide.

The oxygen must come from the air furnished. To secure one pound of oxygen 4.35 pounds of air must come in contact with the carbon and as 2⅔ pounds of oxygen are needed to burn one pound of carbon the air required will be 2⅔ × 4.35 or 11.60 pounds. The result of this union of air and carbon is 3.67 pounds of carbon dioxide plus the nitrogen which is mixed with the oxygen. With every pound of oxygen there is 3.35 pounds of nitrogen so that (2⅔ × 3.35) 8.93 pounds of this element passes through the kiln in addition to the carbon dioxide. The equation, therefore, shows that in burning one pound of carbon 11.60 pounds of air are necessary and there will result 12.60 pounds of waste gas composed of 3.67 pounds of carbon dioxide and 8.93 pounds of nitrogen. A practical application of these figures will help to make apparent their value. For this purpose the "Ultimate analysis" of the coal previously given will be used. This coal contained .7986 × 12.60 = 10.06 pounds of waste gases. To find the actual amounts of air and waste gas add to these quantities the excess needed to secure proper combustion. If the excess air is, say 50 per cent, then that to be supplied by a fan would be 9.26 pounds plus 4.63 pounds or 13.89 pounds and the quantity of waste gas 10.06 pounds plus 5.03 pounds or 15.09 pounds.

Air must be supplied also to burn the hydrogen and sulphur but as these elements are present in such small quantities they may be neglected in the calculations. The coal contains .0427 pounds of oxygen per pound and this will satisfy to hyrodgen partially.

Every pound of coal under consideration generates 14,491 B. T. U's. and a large portion of this heat goes into waste gases. It is the heat in these gases that decomposes the limestone so that the smaller the quantity of air employed to burn the coal the less the resulting gases and the lighter their temperature. One cubic foot of air at 70 degrees F. weighs .0749 pounds so that theoretically 124 cubic feet of air will have to be furnished and with 50 per cent excess this quantity will be increased to 186 cubic feet.

After passing through the kiln the waste gases leave the top at a varying temperature. Assume this temperature to be 400 degrees F. In addition to the carbon dioxide and nitrogen from the fuel the limestone will contribute per pound of stone .44 pounds of carbon dioxide. For every pound of coal burned assume 2.50 pounds of stone decomposed. The carbon dioxide from this stone would be 1.10 pounds which added to the waste gases, from the coal at 50 per cent excess air gives a total of 16.19 pounds. The heat in these gases at 400 degrees F. will be 16.19 × 400 degrees × .235 = 1,520 B. T. U. The figure .235 used in this formula is the specific heat of the gases per pound. The specific heat is the amount of heat required to raise one pound of the gas one degree fahrenheit. If this lost heat could be reclaimed the saving would be very appreciable. Here again is shown the cumulative loss from excess air as every pound of air carries away a quantity of heat hence the less the quantity of air the smaller the stack loss.

With a coal containing say 30 per cent of volatile matter there will be a large proportion of gaseous hydrocarbons and it is these which are hard to burn. They ignite easily but as the carbon and hydrogen are gaseous it is a difficult matter to get an intimate mixture with the oxygen of the air. There have been thousands of patents designed to effect this mixing but in hand firing it is not an easy matter. It is these volatile gases that produce smoke and the only way to prevent smoke is not to make it. Then too the gases distilled from the coal should not meet a cold surface as such a surface will chill the gases below the ignition temperature and they will not burn.

If the air is heated before it comes in contact with the coal it will bring with it some heat and cause better combustion. Moisture in the air, or wet coal, hinders combustion as this water must be heated. In the lime kiln a useful purpose is served by the resulting steam but it does interfere with combustion.

If the gases escaping from the kiln are analyzed it is possible to ascertain the progress of the reactions. The lime kiln differs from other furnaces in that the CO_2 from the stone mixes with the gases from the fuel and when an analysis is made it is impossible to judge the perfection of combustion by the percentage content of the CO_2. A recording CO_2 meter would show the variations of this gas and would give comparative readings which would be of value. An analysis of the gases from the fire box, if taken at the exit, would serve as an indication of combustion conditions and this with another analysis of the gases from the stack would give complete information regarding the kiln operation.

In the rotary kiln burning producer gas or powdered coal it is possible to maintain very uniform conditions due to mechanical feed of fuel and stone. The air supply also is most uniform.

New Williams Air Separator

A new air separator has been put on the market by the Williams Patent Crusher and Pulverizer Company called type "D." The machine which has been under development for some time was designed by an engineer who has had a great deal of experience with fine grinding and air separation work with practically all existing types of machines and it is believed by the manufacturers that this separator corrects many of the common weaknesses and has certain distinct advantages peculiar to its design.

This machine which the manufacturers describe as a revolutionary development can be used for lime, limestone, gypsum, talc, dry chemicals or any other material where the fines are to be extracted by air. Tests have shown that it makes an extremely clean separation leaving few fines in the tailings and it can be adjusted to give a uniform fineness. The fineness of the product is not affected either by over or under feeding and the machine will handle reasonably damp material.

Diatomaceous Earth as an Insulator

Diatomaceous earth is one of the most efficient insulators known, and is supreme between the temperatures 200 degrees F. and 2,000 degrees F., states the Bureau of Mines in Serial 2718, recently issued. Although not quite so effective as some organic materials for low temperatures, it has the advantage of unchanging permanency, not being subject to decomposition or decay, by moisture, time or other agencies that affect ordinary organic matter. The insulating effect is due to the large number of minute enclosed air cells. Air is one of the poorest conductors of heat known, so that when it is prevented from transferring heat by convection it becomes an excellent insulator. To show the fine state of division of the air in diatomaceous earth it has been calculated that in one cubic inch there are 50,000,000 diatom valves, whose silicious content occupies only 20 per cent of the actual volume. Diatomaceous earth will absorb as much as 80 per cent of its own volume of water.

Diatomaceous earth is marketed for insulation as classified loose powder, as aggregate, as crude lumps, sawed crude brick and blocks, kiln-burned bricks and tile, composition bricks and blocks, pipe covering, etc. At present the material is mined almost entirely by open-cut methods. It is taken out in huge blocks which may contain by weight, three times as much water as diatoms. If the material is to be sold as sawed brick or blocks, it is cut to the desired size, otherwise the large blocks are dried directly. The wet material is stacked in the open and after 40 to 50 days hot, dry summer winds will reduce the moisture content to about 5 per cent. Artificial drying has been used to some extent. Some sawed crude material is sold as such, other sawed material is kiln burned, other dried blocks are disintegrated by specially designed machinery, which pulverizes without breaking up the diatom valves. The powder is classified by elaborate pneumatic systems and the graded product sacked for shipping. Waste material too fine for drying is used for the manufacture of composition brick, blocks, cements, etc. The different grades of finished product have an apparent density of from 8 to 30 pounds per cubic foot.

Distribution of Cement

The following figures show shipments from Portland cement mills distributed among the States to which cement was shipped during February and March, 1925 and 1926.

Portland cement shipped from mills into States, in February and March, 1925 and 1926, in barrels

	February		March	
	1925	1926	1925	1926
Alabama	103,518	145,636	177,510	158,810
Alaska	0	264	294	917
Arizona	25,945	28,956	27,009	54,916
Arkansas	44,352	55,984	72,198	66,712
California	753,128	714,783	1,029,118	1,156,509
Colorado	69,871	51,068	102,537	81,623
Connecticut	50,026	29,323	113,668	78,962
Delaware	9,444	6,437	21,766	22,886
District of Columbia	65,176	47,086	58,474	63,249
Florida	227,811	445,674	272,094	402,888
Georgia	98,569	86,417	140,634	139,781
Hawaii	0	15,830	1,500	24,737
Idaho	11,029	19,524	17,667	42,131
Illinois	378,947	429,654	846,638	569,978
Indiana	143,464	121,253	255,597	189,947
Iowa	52,039	50,077	161,164	116,367
Kansas	120,405	114,296	212,402	182,003
Kentucky	68,970	56,249	115,222	88,756
Louisiana	97,638	84,706	98,193	96,214
Maine	5,238	19,084	21,702	18,302
Maryland	98,231	77,537	143,291	132,720
Massachusetts	134,591	57,390	257,381	168,271
Michigan	248,240	253,661	437,712	399,036
Minnesota	97,034	72,714	173,618	164,405
Mississippi	28,564	47,179	35,778	58,308
Missouri	162,992	202,914	379,157	332,104
Montana	6,093	9,867	16,450	17,203
Nebraska	46,281	49,054	99,780	121,456
Nevada	5,177	5,754	7,254	8,824
New Hampshire	15,911	12,750	27,592	18,043
New Jersey	243,534	163,588	498,227	424,812
New Mexico	10,320	14,308	18,865	18,594
New York	587,674	434,323	1,159,830	1,026,883
North Carolina	128,770	139,656	200,097	271,422
North Dakota	3,742	4,903	16,589	23,260
Ohio	271,075	250,265	592,069	419,623
Oklahoma	155,083	167,043	203,161	206,766
Oregon	60,816	58,991	103,813	117,611
Pennsylvania	421,519	351,940	808,636	745,142
Porto Rico	0	0	0	0
Rhode Island	17,908	10,166	54,083	34,888
South Carolina	73,312	56,022	72,929	69,811
South Dakota	14,528	18,848	40,697	38,194
Tennessee	87,499	86,871	116,856	117,610
Texas	345,057	364,107	381,320	367,888
Utah	16,821	15,613	28,567	37,117
Vermont	3,060	1,640	10,312	5,052
Virginia	95,942	77,572	132,891	121,765
Washington	90,668	77,936	151,814	152,534
West Virginia	56,629	45,121	85,703	89,054
Wisconsin	73,320	80,066	142,620	155,826
Wyoming	9,181	11,710	16,858	12,225
Unspecified	26,430	52,720	46,236	36,878
	5,961,563	5,794,530	10,205,073	9,467,908
Foreign Countries	53,437	25,470	73,927	71,092
Total shipped from cement plants	6,015,000	5,820,000	10,279,000	9,539,000

Estimated clinker (unground cement) at the mills at end of each month, 1925 and 1926, in barrels

Month	1925	1926	Month	1925	1926
January	7,017,000	9,074,000	July	6,961,000	....
February	8,497,000	10,931,000	August	5,640,000	....
March	9,962,000	12,284,000[a]	September	4,561,000	....
April	9,731,000	12,853,000	October	4,086,000	....
May	9,053,000	....	November	5,013,000	....
June	7,937,000	....	December	6,469,000	....

a Revised.

A Lime Business as a Woman Runs It

By E. D. Roberts

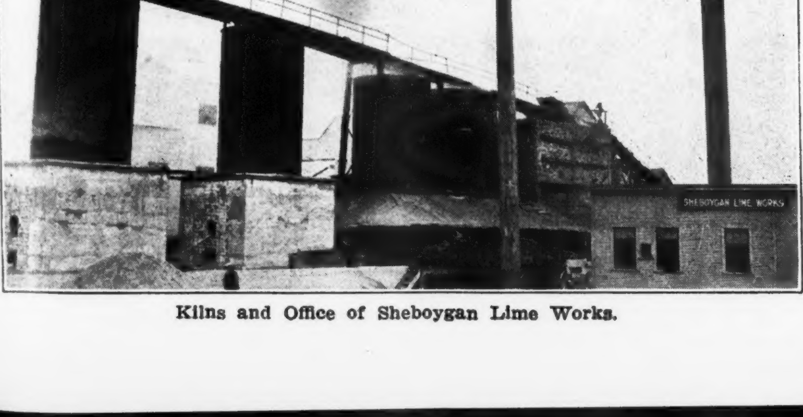
THAT the management of a lime plant can be conducted successfully by a woman has been demonstrated by Miss Elfrieda Roth, secretary-treasurer and general manager of the Sheboygan Lime Works of Sheboygan, Wisconsin. This woman, the daughter of Henry E. Roth, founder of the works, has not only successfully carried out her father's plans but has enlarged the operation and added a hydrating plant.

Henry E. Roth started what is now the Sheboygan Lime Works with an old time pot kiln and 9 acres of limestone property in 1854. He always declared that there was enough lime in the property for his children and his children's children. The quarry is now down 100 feet in some places. The tract of land worked is on Pidgeon River two and a half miles from the center of the city. Mr. Roth incorporated his plant in 1885 and erected two square continuous kilns.

Two years later he died and the business was carried on by his wife and his brother Herman E. Roth until 1900 when the latter died. Mrs. Henriette E. Roth, widow of the founder, carried on, assisted by T. E. Fleischer as general manager. In 1915, Miss Elfrieda E. Roth assumed the duties of secretary-treasurer and general manager. Mr. Fleischer was made superintendent when Miss Roth stepped in and is ably assisting in that capacity at present.

One of Sheboygan's principal industries is the manufacture of enameled ware. These enameling plants use considerable lime and lime rock from the Sheboygan Lime Works in their process. Not content with supplying the local market only, shipments are made to Chicago, St. Paul, Minneapolis and other larger centers where a name has been built up for "Sheboygan White Quick Lime." With the growing demand for hydrated lime and in order to effect economies in the operation of the lime kilns, it was decided to install a hydrating plant. The product is sold under the name of Sheboygan Hydrated Lime and is finding ready favor with users.

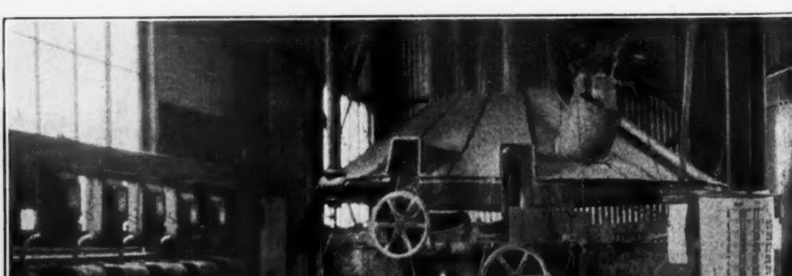
With the growth of the outside demand for their lime, it was realized that the retail should be separated from the wholesale business and as a consequence in 1920 the Roth Building and Supply Company was incorporated by the owners of the Sheboygan Lime Works. Miss Roth was active in the organization of this company and designed a building that was constructed in Sheboygan as a city office where a permanent exposition of building needs is kept. The aggressiveness of



Kilns and Office of Sheboygan Lime Works.

South View of Plant.

Working Face of Quarry.



Batch Hydrator and Operating Panel.

this organization in promoting the use of lime and lime products has resulted in a largely increased demand for lime and consequently has called for an increased production which will be met when the two new kilns now installed are put in operation.

During the 72 years that the quarry has been in operation, over 9 acres have been taken out to a depth averaging 75 feet with thousands of tons of lime rock in sight both laterally and below the present quarry floor. This limestone carries a high magnesium content, being very nearly dolomitic in structure. Like most of Wisconsin's lime deposits it lies in nearly horizontal layers.

Notwithstanding the large area opened up by the quarry, but very little trouble is experienced from water as shown by the fact that a Cameron centrifugal pump with a 4 inch discharge running from 6 to 8 hours per day keeps the quarry dry. The 4 inch centrifugal discharges into a concrete box well at the ordinary ground surface from which smaller pumps supply the plant's water needs, the excess overflowing to the river.

The drill holes for blasting the limestone are put down with Ingersoll-Rand jackhammers. These holes are shot with Hercules 40 per cent gelatine dynamite. Cars are loaded by hand, allowing the development of several faces at once so that drillers and loaders will not interfere with each other. First the rock suitable for burning is loaded by hand into home made cars after which the rejected rock is loaded into side dump Watts mining cars for transportation to the crusher house.

Horses pull the cars to a central point at the foot of the inclines. There are two inclines, one to the kilns and one to the crusher house. Each incline is equipped with automatic switches so that descending cars will take the empty track coming down.

A friction hoist operated by a Wagner 30 h.p. motor pulls the lime kiln cars up the incline and along a track over the tops of the kilns to the point where it is desired to dump the load. A man releases a trip and the charge is center dumped into the top of the kiln. A slope to the track causes the car to return to the bottom of the incline by gravity assisted by the brake on the friction hoist.

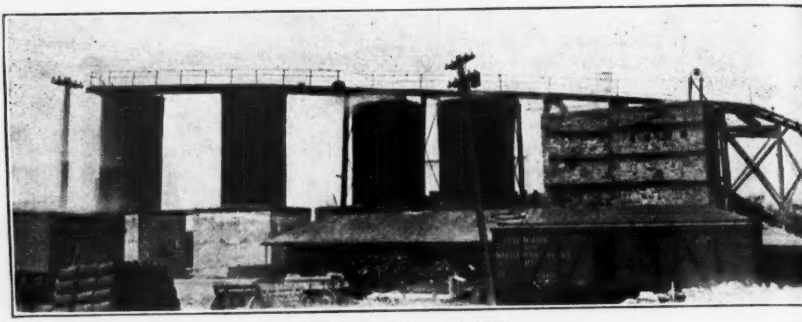
There are six kilns in all, the two stone kilns which were placed in operation in 1885, two 7x7x40 steel kilns, now in service for a little more than twenty years, and the two new kilns of the same size which have just been completed and which will be placed in operation as soon as a shed can be placed over them. The steel kilns are lined with fire brick with an 18 inch layer of cinders between the shell and the brick for insulation purposes. The fire brick and blocks were furnished by A. P. Green Company. After twenty years of constant use, these steel kilns are unwarped and without any pulled rivets. This attests the value of cinder insulation between the fire bricks and outer shell. The two new kilns were fabricated and erected by the Manitowoc Engineering Works.

The lime is burned by a wood fire. The fuel is unloaded from cars, wagons or trucks directly onto the firing floor at the furnace doors. Three men each shift fire the kilns, draw, and load the lime for shipment.

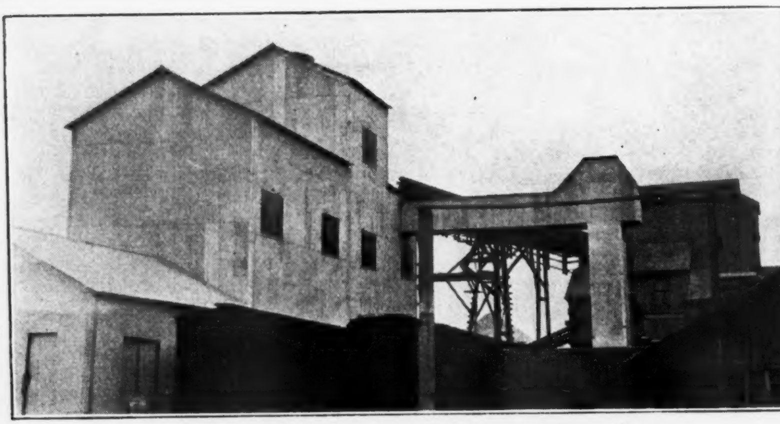
All lime is sold in bulk. This requires that it be cooled after drawing before loading into the cars for shipment to outside points or onto trucks for local delivery. The new kilns are equipped with special barrows so that the lime may cool in them after drawing, thus saving one handling.

The local lime trade demands lump lime of a size that can be handled with a fork. This has been the cause of an accumulation of dust that has previously been sold to the farmers for fertilizer at a low price. Profits are now increased by hydrating the fines in the new plant. Another serious condition which had to be met in the past was the fluctuating demand for the product. This at times caused the outside storage of the burned lime and consequent loss through air slaking and damage by storms. This market fluctuation will not bother them in the future as the material will be stored in the large air tight storage tanks in the hydrating plant or hydrated and stored in air tight bags.

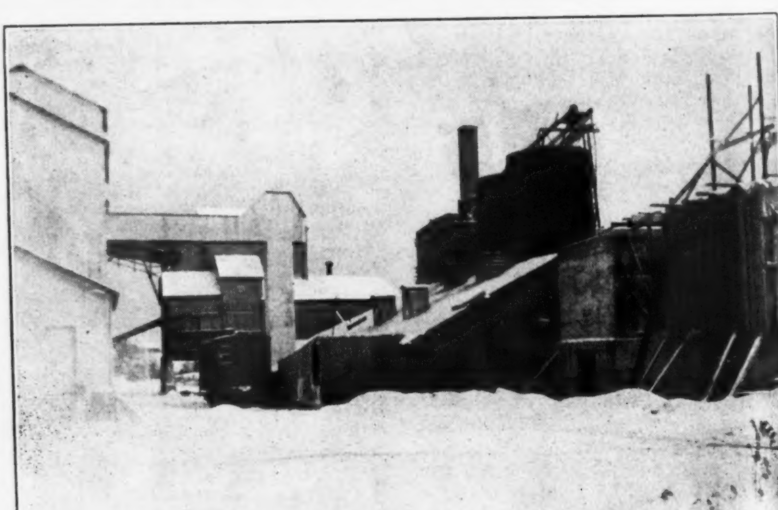
A Sturtevant number 2 pulverizer has been set in the floor of the drawing room into which the lime is dumped. This machine reduces the lime to ¼ inch or smaller. This discharge from the pulverizer falls directly into the boot of a Jeffrey steel cased elevator which carries the lime to a Jeffrey screw conveyor that carries the material over railroad tracks into the hydrating house and discharges it into the top of a large air



Another View of Kilns.



Hydrating Plant With Elevator From Pulverizer.



Winter Scene at Plant.

tight storage tank. This tank is 12 feet in diameter with a capacity for 50 tons.

The lime is drawn from this storage bin by a 9 inch Jeffrey screw conveyor placed in the bottom of the bin. The screw conveyor discharges into another Jeffrey steel cased bucket elevator which lifts the lime to the top of the building and discharges it into a chute leading into a 10 ton bin over the hydrator. From the hydrator, the operator draws it off into a Fairbanks-Morse one ton weighing hopper from which it is discharged directly into the hydrator.

Water for hydration is furnished by a Fairbanks-Morse centrifugal pump located at the concrete well. This pump has an automatic priming device as well as automatic start and stop to keep a certain amount of water in the supply tank located in the top of the hydrating building. The proper amount of water for each batch is drawn from the tank by a valve convenient to the operator.

The hydrator being used is a Clyde, manufactured and installed by the patentee H. Miscampbell of Duluth, Minnesota. A feeder placed in the bottom of the hopper delivers a steady flow of lime to the cooler below. A short screw conveyor draws the cooled hydrated product from the Clyde cooler and discharges it into a Raymond mill for fine grinding. A number 11 special Raymond exhauster draws off the finely powdered material from the Raymond mill and carries it up into the separator on the floor above the mill. The discharge from the separator goes directly into the bin feeding the Bates Valve packer. The vent in the return pipe from the separator is led into a large dust collector which collects the finest dust and discharges it by gravity, when desired, into the bin over the Bates packer.

A four valve Bates Valve packer packs the hydrated lime to 50 and 100 pound paper sacks furnished by the Bates Valve Bag Company. The filled sacks from the packer are loaded directly onto 4 wheel trucks and trucked directly into the car or to storage space in the building.

Everything is arranged so that the capacity of the hydrating plant can be raised from 4 to 8 tons per hour by the installation of another number 3 Clyde hydrator. Power for the operation of all machinery is furnished by Westinghouse motors through Link-Belt silent chain drives with the exception of the Raymond number 11 special exhauster which is directly connected. The starters for all of the motors are located conveniently to the hydrator. Outside of trucking away the sacked product, but two men are required to operate the plant.

The building itself is of strictly fireproof construction. The structural steel frame was fabricated and erected by the Manitowoc Engineering Works. Armco corrugated galvanized iron covers the room and sides of the building. Fenestra steel sash hold the large amount of glass in place giving a very light cheerful place in which to work.

Rock that is not suitable for burning is hauled up the incline into the crusher house by a friction hoist operated by a 30 h.p. Wagner motor. The rock is side dumped from the cars directly into a Gates number 6 gyratory crusher set to crush to 2 inches in size. This crusher is operated by a 75 h.p. Wagner motor. Discharged from the Gates crusher the rock falls into an 8x18 inch continuous bucket elevator which lifts the material and discharges it into a 24 foot Allis Chalmers rotary screen which separates the crushed rock into merchantable sizes—namely 2 to 1½ inch, ½ to ¼ inch, chips and dust. All the different sizes are chuted directly into their respective bins below the screen with the exception of the rejects which are chuted into a Sturtevant number 4 reduction crusher located alongside the Gates gyratory crusher. This allows the discharge from the Sturtevant to fall directly onto the bucket elevator mentioned above.

The chutes from the rotary screen have valves that allow the material to be switched onto either a 20 or a 22 inch conveyor belt that will carry the crushed rock out onto the yard storage pile in case it is found that ground storage is desirable. Slide gates in the bottoms of the bins allow the rock to be drawn directly into trucks waiting below, while reclamation from storage is done with an Orton and Steinbrenner caterpillar locomotive crane and a one yard clam shell bucket or by a Wagner electric loader.

Local distribution is effected by two large Mack trucks, four Federal trucks and several Ford trucks. All of the large trucks are equipped with Heil hydraulic hoists and Heil dump bodies. Each truck in leaving the plant passes over a Fairbanks platform scale, the load is weighed and a ticket handed to the driver for delivery to the purchaser who must also sign a receipt for the delivery of the load.

Other equipment of this plant comprises a complete set of boilers and steam engines used for furnishing power to operate the plant before electricity was available, a small Cameron centrifugal pump for fire protection purposes, and an Ingersoll-Rand compressor, operated by a 40 h.p. Wagner motor.

The original electricity furnished the plant was at 220 volts on two phase. With the increased consumption of electricity due to the installation of the hydrating plant, the electric company has constructed a three phase circuit to the plant and is installing transformers there so that hence forth they will use 220 volt three phase instead of 220 volt two phase current.

The officers of the Sheboygan Lime Works are: Henriette E. Roth, president; Louis Kanitz, vice-president; Elfrieda E. Roth, secretary-treasurer and general manager; and T. E. Fleischer, superintendent. The address of the company and all officers is Sheboygan, Wisconsin, with the exception of Mr. Kanitz who lives at Muskegon, Michigan.

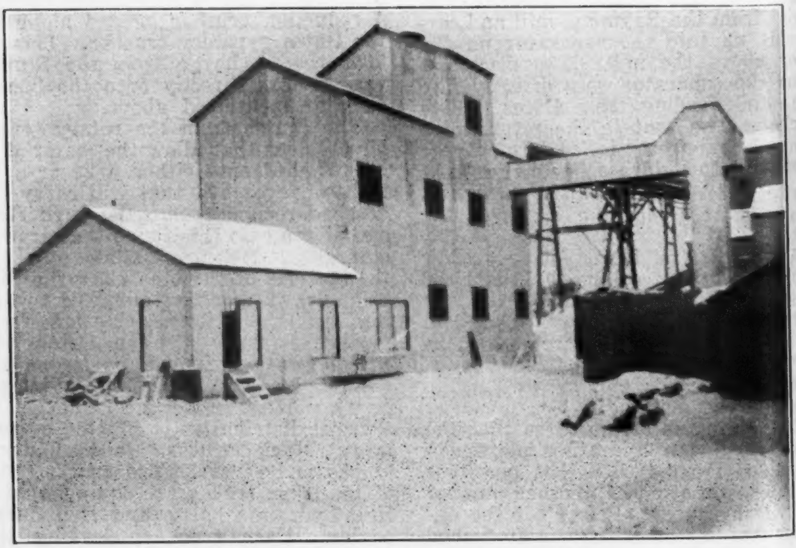
Consumers Sand Company,—Delaware. Una Lee Roberts, service agent, Oklahoma City, Okla.

Gruendler Equipment

The Gruendler line of rock and gravel crushing equipment is fully presented in a handsome and informative catalog recently issued by the manufacturer. The company manufactures both jaw and swing hammer crushers. A tensile strength of 100,000 pounds to the square inch is claimed for the Gruendler Superior all steel jaw crusher. It is designed on the Blake type with the principle of a rail splitter. It is claimed that this machine defies tests by foreign material such as tramp iron drill bits or broken sledge hammers.

The Gruendler heavy duty hammer crusher will reduce large rocks to 1½ inch or finer in one operation, thus saving the cost of secondary crushers. The firm also manufactures a self-contained portable jaw crushing outfit suitable for road work. Complimentary to this unit is the Gruendler portable washing screening and storage plant for sand and gravel. A combination of the two units is also offered.

A full line of permanent screens for both stone and gravel of both revolving and shaking type is also manufactured. For solving the conveying problem the company offers its quarry cars, hoists, bucket elevators, belt conveyors, bin gates and trollies. Air compressors and jack hammer drills complete the line.



Hydrating Plant; Note Overhead Bridge.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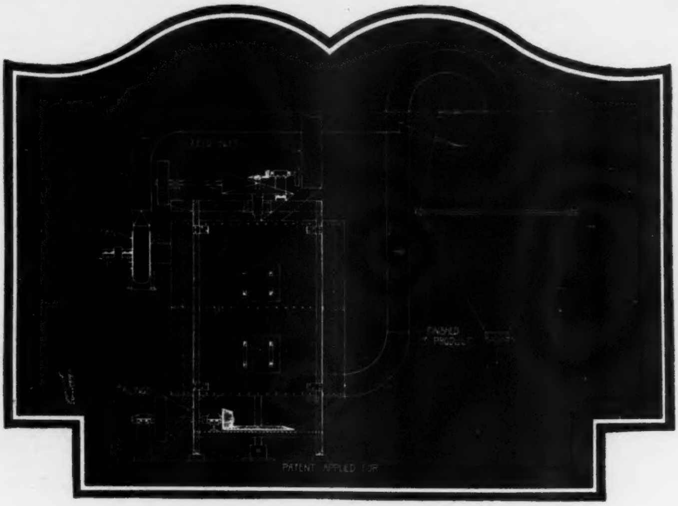

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Calcium Arsenate

A Product for Manufacturers of Hydrated Lime

By John F. Blyth

Industrial Research Chemist

CALCIUM ARSENATE is a logical product for manufacturers of hydrated lime, not only because it offers an outlet for large quantities of lime, but also because it can be manufactured, by means of the recently patented Ellis and Stewart Process*, in modern lime hydrating machinery (either batch or continuous) with little or no changes or additions to the equipment. While chemically, other considerations intrude, the only way, from the standpoint of the lime hydrate manufacturer, in which calcium arsenate manufacture differs from lime hydration is that a solution of arsenic acid is used in place of water.

The calcium arsenate dust-poison method for control of the boll weevil on cotton was developed mainly by the United States Bureau of Entomology, chiefly by B. R. Coad and his associates at the Delta Laboratory, Tallulah, La.

Probably more than 95 per cent of the calcium arsenate is used on cotton, although its use against chewing insects on truck crops is rapidly increasing. The use of airplaines for applying the dust will undoubtedly increase its range of utility. For example, calcium arsenate airplane dusting has recently been proposed for use against mosquitoes in wide areas of swamp lands and against chinch bugs on the Western prairies where, because of building, etc., it is not practical to burn off the brush.

The consumption of calcium arsenate, like all agricultural insecticides, depends on the weather, rainfall, amount of insect infestation, etc., and therefore varies considerably. The consumption in 1923 has been estimated at 15,000 to 17,000 tons. A report of the standing committee on arsenic issued at the end of 1923 suggested that the consumption during 1924 would probably be doubled, but unusually dry weather conditions and comparatively light insect infestation resulted in an over-production of probably 10,000 tons. This over-production caused a sharp decline in prices at the end of that season, but nevertheless in 1925 the manufacturers of calcium arsenate again produced much more material than the market required. Each manufacturer apparently figuring that all his competitors would be discouraged, and that a shortage with consequent high prices would result at the end of the 1925 season. Various market reports and magazine articles encouraged them in this belief. The result is that the market is still unsettled, although there is a profit in the manufacture at the present time owing to the low price at which "white arsenic" is selling. The "dry process" would, of course, show a still larger profit, as its production cost should always be at least one cent per pound below the "wet processes" now in use.

Commercial calcium arsenate, conforming to the government specifications, contains approximately 71 per cent of tri-calcium-arsenate and 29 per cent of hydrated lime and other inert ingredients. Expressed in terms of molecules, for every molecule of tri-calcium-arsenate there are approximately 2.2 molecules of excess hydrated lime.

Incidentally, the government specifications for calcium arsenate call for a total arsenic content exceeding 40 per cent arsenic pentoxide, a water soluble arsenic pentoxide content of less than three-quarters of one per cent, and a density of 80 to 100 cubic inches per pound when tested in the Coad apparatus. Material testing 80 to 100 cubic inches to the pound in this apparatus will measure about 60 to 65 cubic inches as ordinarily packaged. Calcium arsenate is applied to cotton plants in the form of a dry dust cloud, at the rate of about five to seven pounds per acre per application. Three to five applications per season is customary.

The materials used in the so-called "dry process" manufacture of calcium arsenate are quicklime and arsenic acid solution. It might be well to note at this point that some confusion has resulted from the promiscuous use of the word "arsenic."

*Process is covered by U. S. Patents Nos. 1,447,202 and 1,447,938; Application No. 628,010 (March 5, 1923) and other applications.

"Arsenic," or white Arsenic (As_2O_3), which should properly be called arsenic tri-oxide, is a white powder and is the most common commercial form of arsenic. Arsenic acid, or arsenic pentoxide (As_2O_5), on the other hand appears in commerce in the form of a concentrated water solution containing 75 per cent arsenic acid (which is equivalent to 60 per cent arsenic pentoxide). This solution resembles sulphuric acid or "oil of vitriol," and is the compound used in making calcium arsenate. It may be purchased in glass carboys or ordinary steel tank cars. Its manufacture from "white arsenic" is a comparatively simple matter.

In making calcium arsenate by the wet process, approximately equal weights of hydrated lime and 75 per cent arsenic acid solution are used with a large volume of water. This process requires heating and agitation for a considerable time, and necessitates the evaporation or elimination of 80 per cent or more of water. For this reason the wet process requires between three-quarters and one ton of coal for every ton of calcium arsenate produced.

Now, however, through the investigations of Carleton Ellis of the Ellis Laboratories, Montclair, New Jersey, and Prof. V. T. Stewart of the Newark Technical School, a process of making calcium arsenate by the dry slaking of lime in the presence of arsenic acid has been developed and patented. This new and cheaper method appears to have great possibilities as a means of preparing this very valuable substance. Mr. Ellis has been a pioneer in the development of the continuous hydration of lime. Over 20 years ago, he invented and obtained patents on the hydration of lime, of which he later disposed to the Kritzer Company.

By means of this new patented dry process it is possible for any producer of high grade, high calcium, hydrated lime, who has modern hydrating equipment, to produce calcium arsenate with only very minor additions to his machinery. The essential difference being that instead of using water for slaking, a solution of arsenic acid is substituted. A dry product is obtained directly from the hydrator and requires only disintegration in a Raymond mill (or similar apparatus) before being packaged and marketed. To anyone familiar with the laborious and expensive operations of the wet processes now employed to obtain the same result, the improvement in hand will be obvious.

The writer, who has had considerable experience in the manufacture of calcium arsenate, and who has supervised the manufacture of about 5,000 tons by the wet process, has made an extensive laboratory investigation of this new and cheaper process and has become a thorough believer in it.

A preliminary small commercial run of calcium arsenate by the dry process was made about a year ago. The tests were made in a Schaefer continuous hydrator at the plant of E. Dillon's Sons, Indian Rock, Virginia, and were financed by L. P. Dillon and James A. McNamara. The results were very promising from a chemical point of view, as we produced a product having the required arsenic content and being considerably superior to the government standard on water soluble arsenic content.

The preliminary experiment was made at a time when the calcium arsenate market was rather unsettled and when it was therefore inadvisable to tie up any large amount of capital in the finished product. The amount of arsenic acid supplied was only sufficient for a total of two runs of one hour each, even though the poidometer was operated at its minimum of about four pounds of lime per foot of belt.

Owing to trouble at the quarries, the company was unable to supply their usual high-grade high calcium quick lime and we operated on their ordinary crushed run of kiln product (for agricultural hydrate), which contained a large amount of material up to one inch in size and which contained a comparatively large percentage of core.

We started off using this coarse material and controlling the excess water by hand. The strong arsenic acid solution being added by means of calibrated pump on the poidometer. Under these conditions a large amount of gritty material was thrown out as tailings by the Raymond mill. The operator of the Schaefer hydrator claimed this was due to an insufficient amount of water. The amount of water was therefore increased, with the result that we obtained a product containing 12 per cent of free moisture. Subsequent examination indicated that the gritty tailing was due to the fact that the quick lime was not ground fine enough before hydration.

The following day the second run was made using a much finer quick lime. However, at the start of the second run the hydrator still contained about one ton of damp material from the preceding run. The product obtained from the second run was much better, in that the free moisture content was cut down to 3 per cent, and no trouble was experienced with gritty tailings. The supply of arsenic acid became exhausted at this point and no further commercial tests have been run.

A subsequent examination of the three types of lime available at the Dillon quarries indicated that we had not used the type best suited for calcium arsenate manufacture. As for this purpose a quick lime yielding a "fat" or fluffy hydrate is desirable. We also found that when the hydrator was installed only one-half of the agitating plows were put in. An additional run using a better grade of quick lime, ground very fine, would no doubt yield a much fluffier calcium arsenate. The amount of excess water must also be more accurately controlled. In the continuous process the addition of this water should preferably be regulated by an additional pump synchronized with the pump on the poidometer. In this way the amount of water could be varied independently from the arsenic acid. The purpose of this additional water is to absorb the heat of the reaction and to hydrate the excess lime present. The batch process of hydration would, of course, greatly simplify the weighing and measuring problem, although the continuous hydration machinery worked very satisfactorily as regards maintaining accurate chemical percentages of arsenic in the finished product. Thus these tests, although not carried through completely in all respects, due to the unfavorable conditions stated, which by the way were due to no fault of the dry process, nevertheless were sufficient to indicate clearly to me that the Ellis and Stewart method had much to commend it.

In order to produce one hundred pounds of commercial calcium arsenate conforming to the government requirements, about 51.9 pounds of quick lime and 67.5 pounds of 75 per cent arsenic acid would be required. It would also be necessary to add about 25 pounds of water to absorb the heat of the reaction.

There appears to be a difference in the physical properties of the products obtained by the wet and dry processes. The wet processes material appears to be in the form of plates or leaflets, and the dry process material appears to be in the form of spheres. The dry process material is more finely divided, and should therefore cover better and adhere to the foliage better than the wet process material. Furthermore, since the dry process material contains appreciably less water soluble arsenic than the product obtained by the wet process, the dry process material should have considerable less harmful action to the foliage of the plant. It is also thought probable that dry process calcium arsenate will be found to decompose much more uniformly, both on the foliage and inside the stomach of the insects. By the dry process it is possible to produce a product much stronger in total combined arsenic than can be done by the wet methods now in use. A product approximating Paris Green in total arsenic is readily prepared at less than half the cost of Paris Green.

Regarding the sale and distribution, probably more than 95 per cent of the calcium arsenate sold by the manufacturers is shipped in 100 and 200 pound packages, greater preference being shown for the 100 pound steel drums. Carload lots are of 30,000 pounds net. The active selling season opens about November 15th, with prices being offered for spot and future shipments, and extends up to about August 1st.

Calcium arsenate is sold principally through a number of large well known brokers and dealers in the consuming districts. The brokers sell it entirely on a commission basis to dealers and consumers. It is customary to have a salesman visit these brokers in order to accelerate sales and appoint new connections, as well as to superintend their districts. With some manufacturers their salesmen operate on straight salary, while others work on a percentage basis. There are, however, several very large dealers as well as state departments who purchase large quantities of calcium arsenate and who maintain their own selling organizations.

It is probably well to mention at this point that the trade has accustomed itself to sight draft terms and it is not necessary to offer terms to sell good material. A few manufacturers whose product is not considered the best, do offer terms as an inducement, but such competition is really not to be considered.

It is customary in the trade that when material is sold during the winter for spring delivery, that the manufacturer will guarantee his price against decline. Some manufacturers, whose products do not enjoy the best reputations, have gone so far as to guarantee their product against the decline of any manufacturers prices and in some cases, with disastrous results. The more reputable manufacturers, however, guarantee against decline on their own prices only and several of them insist upon a deposit with the order before giving this guarantee. However, when such a deposit is placed, an inducement of a discount is usually offered.

In figuring the net proceeds to the manufacturer the following items must be considered:

Freight

Discounts

Commission to Broker (usually 3½ per cent)

Commission to Salesman (usually 2½ to 3½ per cent)

Direct sales expenses

Indirect sales expenses.

In my experience I have found that exclusive of freight and discounts, other sales expense items will average between 9 per cent and 10 per cent of the selling price. These figures will only apply when fair quantities of material are considered. (Approximately 3,000 tons yearly.)

The principal market for calcium arsenate comprises the cotton growing states of the South and Southwest. They include the following: North Carolina (southern part), South Carolina, Georgia, Alabama, Mississippi, Louisiana, Tennessee, Arkansas, Texas, and parts of Oklahoma and Missouri.

Dean-Hill Pumps

Two new catalogs have just been issued by the manufactures of Dean-Hill pumps. One deals with the company's horizontal single suction centrifugal pumps and the other with its reciprocating deep well pump heads. Both contain much interesting information for the pump user, including clear diagrams and useful tabular matter.

The catalog of horizontal single suction centrifugals is known as bulletin 203. The casing of this type of pump is made of hard close grained cast iron, cast in half and split vertically to give ready access to the interior for inspection. The suction opening in horizontal, central to the shaft. The discharge opening in the standard construction is below the center of the pump pointing horizontally. However the volute body may be swung to any desired angular position. The impeller is made of cast iron but can be furnished of bronze composition. The shaft is of ample size and thickness to insure stiffness and transmit the required horse power.

Bulletin 1501 is devoted to the deep well pumping heads. These have been on the market for more than thirty years. Their outstanding features are the simplicity of design and rugged construction. They are applicable to operating either single or double acting cylinders.

The plunger is securely fitted to the cross head and held by a nut. It can be disconnected without twisting the plunger or the rods in the well. Connection can be furnished to give discharge either above or below the base.

Material Firm Changes Name

The United Fuel and Supply Company of Detroit, Michigan, one of the largest building supply companies in the country and operators of modern sand and gravel pits at Oxford, New Hudson, and Utica, Michigan, has changed its corporate name to the C. N. Ray Corporation.

The work of the corporation will be carried on through four subsidiary companies, the Ray Sand and Gravel Company, the Ray Fuel Company, the Ray Land Company and the National Services, Inc. The activities of the first two concerns is obvious from their titles, the Ray Land Company will deal in real estate, mortgages, rentals, appraisals, etc., and the National Services, Inc., will furnish service active and advisory, in connection with all types of established insurance, will furnish data as to industrial situations, make researches and give advisory service in matters before various federal and state departments. The parent company will carry on the wholesale work of the organization.

The officers of the new corporation are the same as the old: C. N. Ray, president; George F. Barr, vice-president and treasurer; Charles H. Ray, secretary; James F. Donnellon, assistant secretary.

Simplicity in Lime Manufacture

By George Ransom

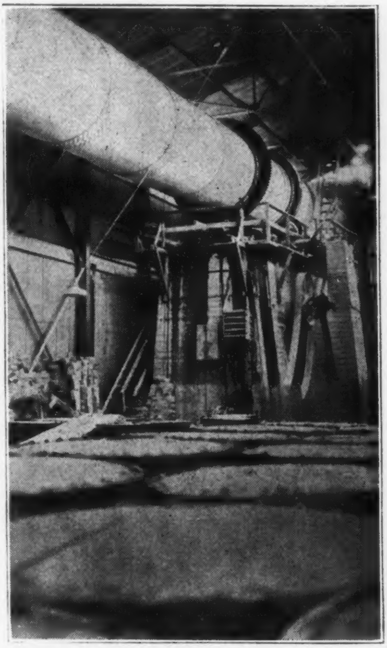
LIMESTONE deposits at West Stockbridge, Massachusetts, in the heart of the Berkshire hills lime industry, are of two varieties hard and soft and the Tobey Lime Company utilizes both in the manufacture of its product. Both are high calcium stone but by their characteristics are so different that they must be calcined by different methods.

The hard stone is burned in wood fired shaft kilns but the soft stone crumbles so badly in the process of calcining that it is difficult to burn it in stack kilns. To meet this condition the company has installed a 7 by 120 foot Vulcan rotary kiln.

The two varieties of stone are taken from different quarry faces, one of which is a considerable distance from the plant.

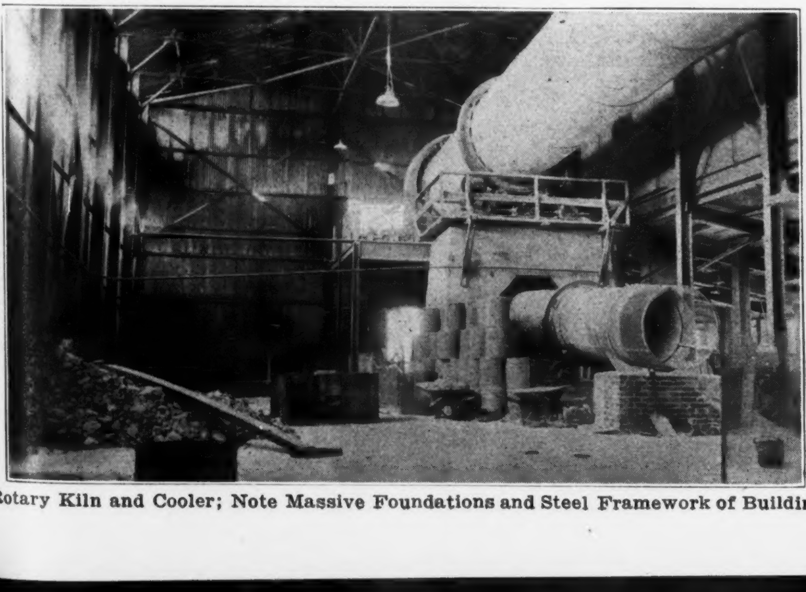
Stone from the nearby quarry is hauled by two Brookfield gasoline locomotives in home-made cars. From the other it is being temporarily transported by horse drawn trucks for which motor trucks will soon be substituted.

The rotary kiln is interesting because it is new and has associated with it the most up-to-date labor saving equipment, and when the quarry stone is once discharged from the quarry cars it requires no further handling until it is bagged or barrelled; the sequence of the operation is as follows.

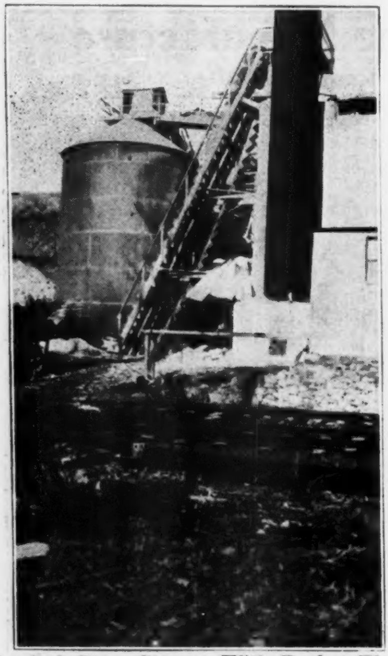


Intake End of Kiln Showing Concrete Foundation; Control Equipment for Motor Drive, Belt and Chain Drive.

The stone is first dumped into a Number 6 Traylor gyratory crusher which reduces it to pieces two inches



Rotary Kiln and Cooler; Note Massive Foundations and Steel Framework of Building.



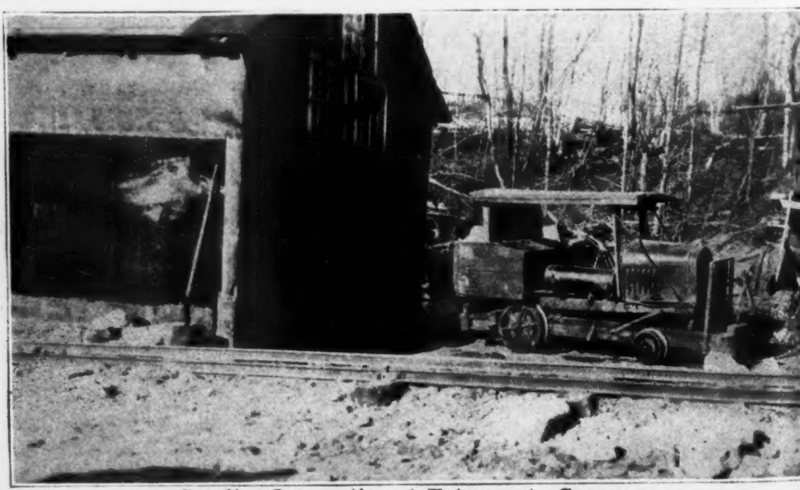
Crushed Stone Storage With Bucket Elevator to Rotary Kiln.

Wood Burning Stack Kiln Showing Track for Loading.

in size or under. This is located at a high elevation so that the crushed limestone may be carried on a 20-inch belt conveyor, made by the Link-Belt Company, to a large stone storage tank.

From the bottom of this tank the material is taken by a Link-Belt bucket elevator which discharges into the rotary kiln. By means of a variable speed General Electric motor this kiln can be operated at 10 different speeds. After passing through the kiln and cooler the burned lime is taken by a Link-Belt screw conveyor to another bucket elevator made by the same company, which deposits it in the lime storage tanks.

These speeds vary from one-half to two revolutions per minute. The stone

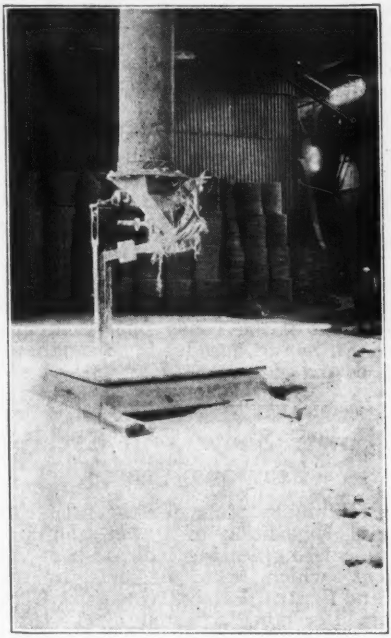


Gasoline Locomotive at Entrance to Garage feed elevator is driven by the kiln so that the feed varies automatically with the speed of the kiln. Starting from the firing end the kiln is lined with 40 feet of 9-inch silica blocks, 40 feet of 9-inch rotary kiln fire brick lining and 40 feet of 6-inch rotary kiln fire brick lining.

The kiln is heated by oil. The burner was installed by the W. N. Best Furnace and Burner Corporation. The capacity of the kiln is 70 tons for a 24-hour day. Provision has been made for the installation of another kiln parallel with the first. Underneath the storage tanks are the spouts for filling either bags, wooden barrels or steel barrels which rest on Fairbanks' scales while being filled.

Oil is stored outside the building in two large steel tanks made by the Dover Boiler Works and is pumped by means of Worthington pumps. The kilns and cooler are driven by General Electric induction motors with push button control and Link-Belt chain drive. There are three wood burning stock kilns and the lime from these is sold under the trade name of Globular lime.

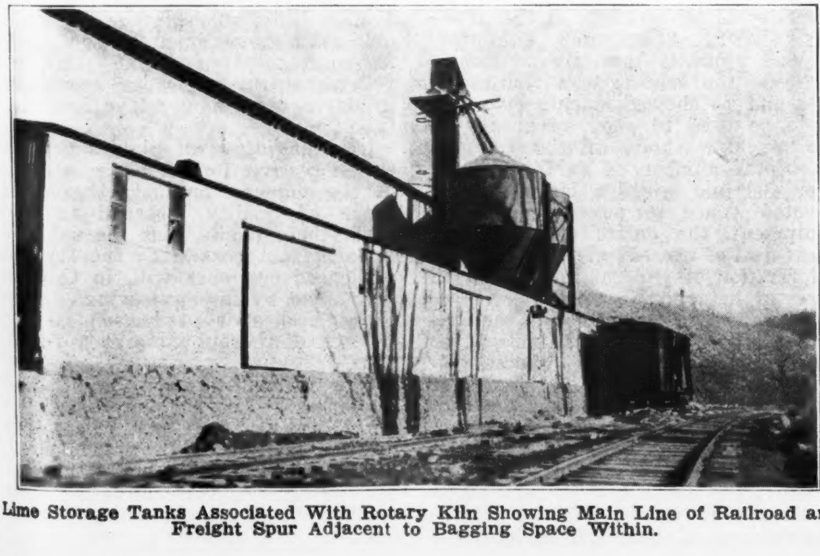
It is shipped in steel and wood barrels. Of course a good deal of material has to be moved by hand both in drawing the hot lime and moving the cold lime. The hot lime is hooked from the kilns into home made steel dump carts and Fairbanks wheel barrows are used for the handling.



Fairbanks Scales and Bagging Spout Under One of Bins.

The steel barrels are made in part at the plant by the use of the usual Stoll machines, which are operated by Westinghouse motors.

The building in which the rotary kiln is housed is of steel with steel



Lime Storage Tanks Associated With Rotary Kiln Showing Main Line of Railroad and Freight Spur Adjacent to Bagging Space Within.

sheathing and roofing. One of the most striking features of the interior of this building are the massive concrete piers which support the kiln of which an idea may be obtained from the photographs.

The plant is situated on a branch of the New Haven Railroad and as will be seen from the pictures the freight car siding for shipping the finished product has been a very easy matter to provide.

The plant was designed by Howell D. Pratt and built by the Wilbur G. Hudson Company. J. M. Deely is president of the Tobey Lime Company and Anthony Consolini is superintendent of the plant.

Power Show Will Excel Previous Years

Preliminary plans for the fifth National Exposition of Power and Mechanical Engineering indicate that the event, which is to be held in the Grand Central Palace, New York City, from December 6 through 11, 1926, will be even larger and more inclusive than last year's show.

Three entire floors of the Palace have been sold to exhibitors and a portion of the fourth floor. Contracts have been signed with 332 manufacturers of all types of mechanical and power plant equipment. The manner in which this important annual event is serving all of the mechanical industries is well illustrated by the diversity of the exhibits at the previous show. About 140 exhibitors showed products that are of importance to the heating and ventilating field and 75 showed machinery which could be used to good advantage in the machine shops of the country. The total number of exhibitors was over 400 and while a large number devoted space to power generating equipment, the entire show gave a great deal of exceedingly valuable new information of general interest to all types of industry.

An important innovation in the conduct of the coming exposition will be the addition of several exhibits essentially educational in character which point out the tremendous advances that are being made in mechanical design and construction.

The exhibition managers are assisted in the conduct of the exposition by an advisory board made up of representatives of technical societies in the mechanical field and also representatives of large users of mechanical equipment who are interested in maintaining the high standing of the exposition.

Link Belt Sales School

During the course of a year any large organization finds it necessary to add new men to the sales force. Regardless of their previous experience they must be coached in company policies and standards of practice. They must be educated as to machinery design and construction before success can be expected from them.

Realizing that this education and training is most expensive and that at best it can be accomplished only over quite a period of time, the Link-Belt Company of Chicago, Indianapolis and Philadelphia, have adopted the policy of holding annual sales schools. The most recent of these schools held at the company's Indianapolis plants, May 11th to 14th, inclusive, composed of 30 salesmen, was addressed by George P. Torrence, general manager of the Ewart and Dodge plants; James S. Watson, manager of the Dodge works, and many others, including foundry heads, shop managers and metallurgical specialists.

Not only does this type of "school" permit the salesmen to inspect the plants, in which many types of malleable iron and steel chain, for elevating, conveying, and power transmission, and innuemerable kinds of malleable castings are manufactured in the Ewart plant, and silent chain and roller chain in the Dodge works—but it also serves many other important functions.

The magnitude of plant operation; the necessity for absolute accuracy in the finished product; the importance of quality material to work with; these points, plus the value resultant from possessing the favor of a pleased customer will, in the long run, offset by far any savings derived through cheaper production methods by lack of thoroughness in workmanship.

The "school" offers, in addition, an opportunity for the interchange of ideas among the men themselves, coming as they do from such widely separated points; and makes for better feeling, real fraternity, and a dissemination of valuable sales information.

Aluminate Cement

Related Problems and New Investigations

By Hans Eisenback*

Part II

Chlorides; in order to study the effects of chlorides on aluminate cements test blocks were immersed in 10 per cent sodium chloride 33° Be[1] magnesium chloride and 10 per cent calcium chloride. As appears in Table IX and figures 22 to 24 no corrosion occurred and in ordinary salt solution the compression strength rose after 6 months to the enormous value of 846 Kg/cm^2. It is noteworthy that variations occur in tensile strength and remain only as high as the initial values. Even in so concentrated a solution as 33° Be[1] Mgcl₂ aluminate cement shows a continuously increasing value of its compression strength, while the tensile strength decreases slightly from the third to the sixth month so that it can be safely used in the industries employing magnesia solutions.

Carbonates. The action of 5 per cent sodium carbonate produces a considerable diminution of the strength values of aluminate cements in 6 months, whereas portland cement is not attacked. It seems that aluminate cements are not equal to the corrosive action of alkaline liquids especially if they exist as carbonates. (Table X and figure 25.)

Gases. Tests on the resistance of aluminate cement to the action of gases have not hitherto been carried out, but are being planned now. It has been shown so far only that carbonic acid has the power of interfering with hardening so that the surface of a hardening test piece made of cement alone shows a sandiness. (Vierheller, Zement 1925, Vol. 14, page 597.)

3. Hardening power even at low temperatures. Hand in hand with the extremely rapid hardening of aluminate cement there is a considerable liberation of heat which occurs during and immediately after the setting of the cement. This phenomenon observed by W. Dyckerhoff (Zement 1924, vol. 13, page 387) in a French cement and by Hitszsche and Gündel in German aluminate cement was examined again in the case of Alca-cement. From the temperature curve, figure 26, it appears that the heating commences after the beginning of the setting and reaches its maximum a certain time after setting has been completed. This property of spontaneous rise in temperature during setting gives aluminate cement a great advantage over portland cement in which, as is well known, such a heating process occurs only to a slight

TABLE X Action of 5% of Sodium Carbonate

Time	Kind of Cement	C	T
1A + 1W	Alca	488	24.3
		...	...
7 days 1A + 6W	Alca	536	27.6
	Portland ...	317	27.0
28 days 1A + 27W	Alca	606	25.3
	Portland	379	33.6
56 days 1A + 55W	Alca	589	24.7
	Portland	433	36.4
90 days 1A + 89W	Alca	530	26.4
	Portland	478	36.8
180 days 1A + 179 W	Alca	447	15.7
	Portland	499	43.5

TABLE IX (1 Cement : 3 Standard Sand)
Action of Sulfate Solutions

Solution		5% Potassium Bisulfate		10% Sodium Sulfate		7½ Magnesium Sulfate		CC_aSO_4 Saturated	
Time		C	T	C	T	C	T	C	T
2 days 1A + 1W	Alca	491	23.4	436	24.3	557	26.3	331	22.4
	Portland	...	...	...	...	...	...	...	...
7 days 1A + 6W	Alca	542	22.5	497	25.1	547	25.0	380	22.7
	Portland	296	31.5	217	26.8	271	29.8	269	28.5
28 days 1A + 27W	Alca	513	26.1	591	28.8	634	33.4	451	28.8
	Portland	331	29.5	291	27.1	327	31.4	348	34.1
56 days 1A + 55W	Alca	566	28.2	628	30.3	656	32.2	...	36.2
	Portland	294	29.8	363	25.6	334	25.2	369	35.6
90 days 1A + 89W	Alca	617	27.5	666	30.4	677	38.0	419	39.5
	Portland	219	27.2	350	11.8	358	22.0	345	30.1
180 days 1A + 179W	Alca	634	28.1	725	35.6	827	39.5	440	37.8
	Portland	178	24.9	246*	0*	357*	5.4*	349	11.4

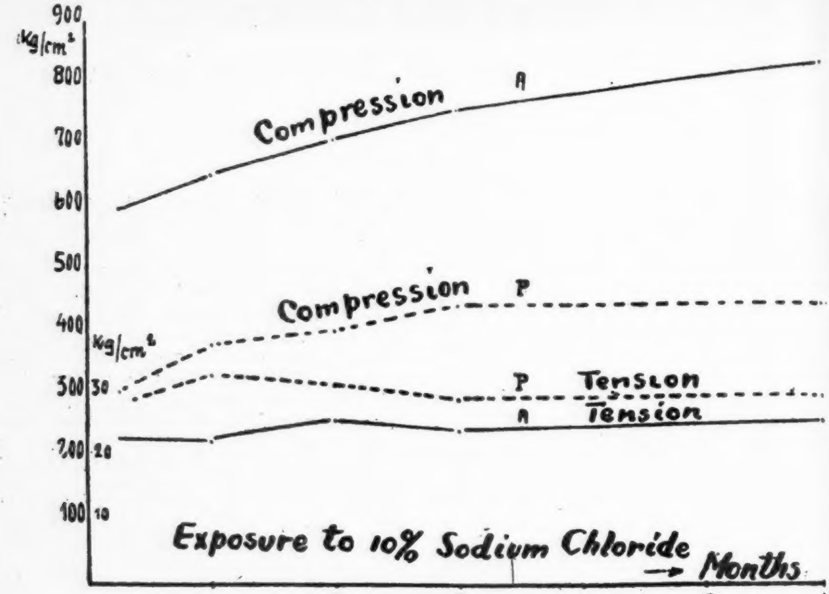

900
Kg/cm²
800
700
600
500
400
300
200
100
Kg/cm²
30
20
10
Compression A
Compression P
P Tension
A Tension
Exposure to 10% Sodium Chloride
→ Months
1
2
3
4
5
6

Fig 22

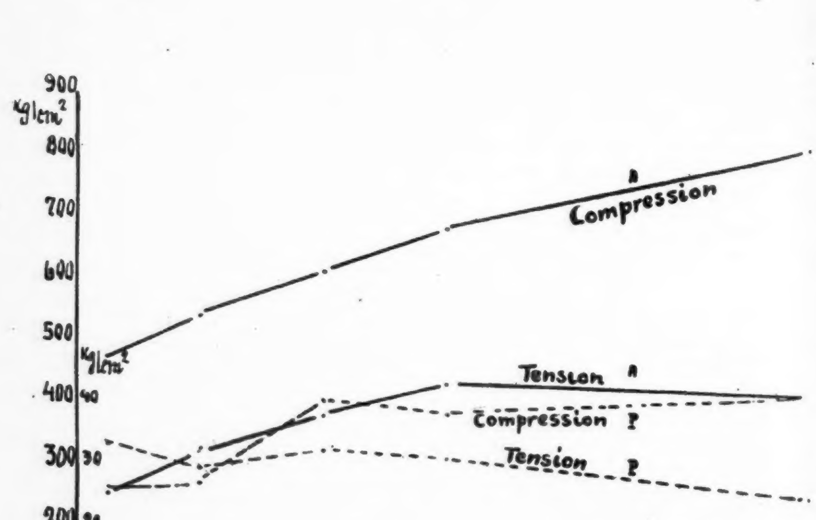

900
Kg/cm²
800
700
600
500
400
300
200
100
Kg/cm²
40
30
20
10
A Compression
Tension A
Compression P
Tension P
Exposure to Magnesiumchloride 33° Bé
1
2
3
4
→ 5 Months
6

Fig 23

extent. Aluminate cements because of this property can be used at temperatures below freezing, in winter and in chilled shaft work, and as a matter of fact this property has been taken advantage of in practice, as the heating action occurs sufficiently strong even in concrete to produce a perfect setting (Wylecol, Braunkohle, #20, Aug. 1925). The tests made to determine this effect by the National Bureau for Testing Materials at Berlin-Dahlem resulted as follows:

Test 1. The compression test pieces were chilled immediately after molding and exposed for 5 hours to a temperature of about minus 6 degrees C. (21 degrees F.) and then thawed out for 24 hours at room temperature (+ 18 degrees C.): compression strength averaged 466 kg/cm².

Test 2. Chilled immediately after molding, subjected for 24 hours to a temperature of minus 60 degrees C. and then thawed out for 24 hours at room temperature (+ 18 degrees C): compression strength averaged 512 Kg/cm².

All the samples after exposure to frost showed no visible external changes.

As these tests made by the Bureau do not indicate whether the hardening occurred during the exposure to frost or only during the thawing, a test was conducted in which compression test pieces immediately after molding without being removed from the iron forms were immediately put into cold boxes and subjected for 24 hours to an average temperature of minus 6 degrees C. At the end of this period the test pieces were taken from the cold box and one series tested immediately while another was thawed out at room temperature (+ 18 degrees C) and subjected to tests after certain periods of time had elapsed. The results are given in Table XI.

TABLE XI

1 Alca : 3 standard sand, subjected for 24 hours to freezing at —3°C. to —6°C. immediately after filling molds.

24	hours after filling molds	107 kg/cm²
24½	" " " "	86 "
25	" " " "	113 "
27	" " " "	120 "
29	" " " "	162 "
34	" " " "	279 "
39	" " " "	310 "
48	" " " "	400 "

It thus appears that the test pieces had by no means hardened, but showed only a certain initial strength which as a matter of fact appreciably decreased after a half hour's thawing and only after an additional 24 hours were the normal values obtained. As this result was not to be expected from the setting temperature curve of aluminate cement and is also contradicted by the results obtained in construction work, the conclusion was

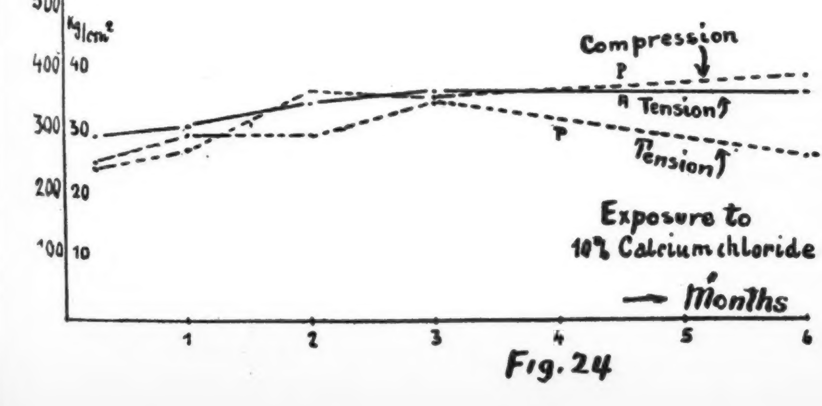


Fig. 24

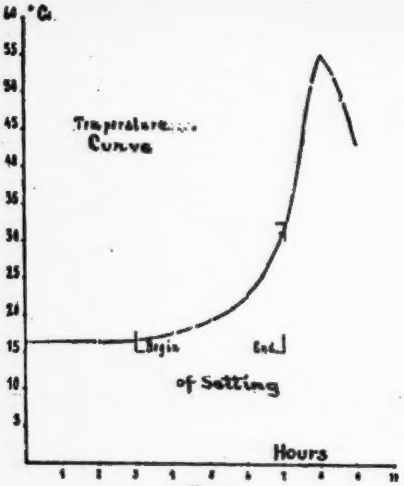


Fig 26.

TABLE XII

Block 30x30x30 cm., stamped down by hand and immediately removed from the form.
1 Alca: 3 standard sand.

Time	Temperature Outside	Center of block Center of block
11:00	−6.oC.	+15.5
11:30	−6.0	+15.0
12:00	−5.5	+11.0
12:30	−5.0	+ 7.5
1:00	−5.0	+ 5.2
1:30	−5.0	+ 4.0
2:00	−4.0	+ 4.0
2:30	−4.0	+ 4.5
3:00	−4.0	+ 5.0
3:30	−4.0	+ 5.5
4:00	−4.0	+ 5.0
4:30	−4.5	+ 6.0
5:00	−5.0	+ 6.0
5:30	−5.0	+ 5.8
6:00	−5.0	+ 5.0
6:30	−5.5	+ 4.5
7:00	−5.8	+ 3.8
7:30	−6.0	+ 3.0
8:00	−6.0	+ 2.2
8:30	−6.4	+ 1.5
9:00	−6.4	+ 1.2
9:30	−6.4	+ 0.8
10:00	−6.5	+ 0.3
10:30	--6.8	+ 0.2

drawn that the experimental conditions were at fault. If we note that the liberation of heat by aluminate cement occurs only starting with the beginning of the setting process and that the beginning of the setting process occurs 3 hours after mixing, we must assume that the effect of the freezing in relatively small test pieces has penetrated so far that the major portion of the water used to produce the batch is present only as ice so that no hydration occurs. But if the mass of the concrete shape is sufficiently large in proportion to the surface to resist the penetration of freezing up to the time of the beginning of setting, the heat of the setting process counteracts the freezing effect, the added water remains liquid and a complete hardening results.

On the basis of these considerations two concrete blocks 30x30x30 cm (1 foot cube) was made of Alca fused cement. Gravel, cement and water were at a temperature of + 18 degrees C. In each block a small glass tube was imbedded reaching to the center of the block. It was filled with mercury and served to hold a thermometer. Both blocks immediately after molding were exposed to frost in

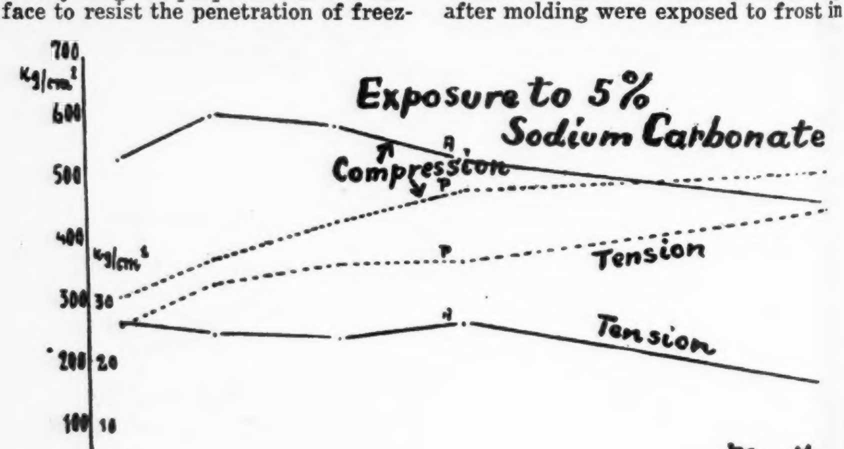


Fig 25

the open air; one of the blocks was also removed from the forms at once, while the other remained in the form and its surface was covered with a thin layer of gravel. The results are given in Tables XII and XIII and figures 27 and 28. The block which was removed from the forms had a layer ½ to 1 cm thick on all the surfaces (except the bottom) consisting of friable moist concrete but was otherwise sound throughout, while the second block which remained in its form was completely hardened and gave a clear sound when struck by the hammer. Its compression strength was 398 Kg/cm².

This remarkable property of aluminate cement has its disadvantages too. The height of the maximum temperature increases naturally as the external temperature is higher and with it the volume of the cement shape increased. Thus if at high outside temperatures, for instance on a hot summer's day pure aluminate cement is used for facing, the union between the main concrete mass and the rich facing occurs just at the time when the latter has expanded most because of the large rise in temperature. Then there is a gradual cooling of the bonded facing, it contracts and powerful stresses appear so that the facing shows contraction cracks and in very bad cases actually peels from the main concrete body. This occurrence in practice could not be explained at first until finally comprehensive tests cleared up the problem. A sheet of concrete made of fused cement (1.5 x 1 meter) several weeks old was kept in a room held at a constant temperature of 30 degrees C., and was faced with aluminate cement using 1 part of cement to 1 part of fine wall cement and this was smooth finished with a layer 2 mm thick of pure cement. After 24 hours the entire facing had lifted itself from the concrete sheet and had to be removed. A similar facing applied to the same concrete sheet in the open on a cool, rainy day in September adhered smoothly and gave no cause for objection whatsoever.

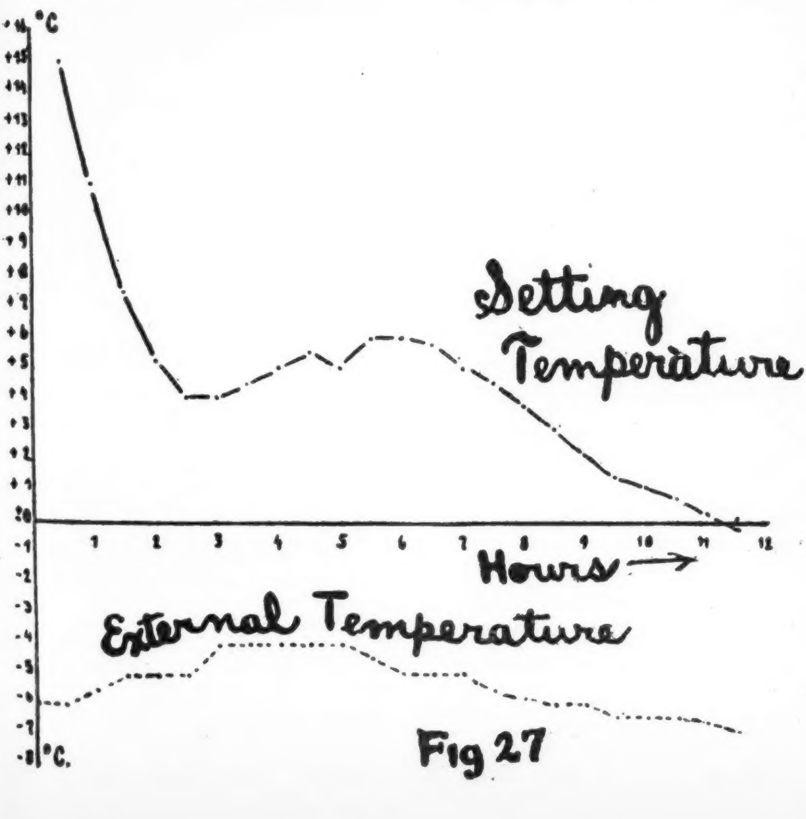


Fig 27

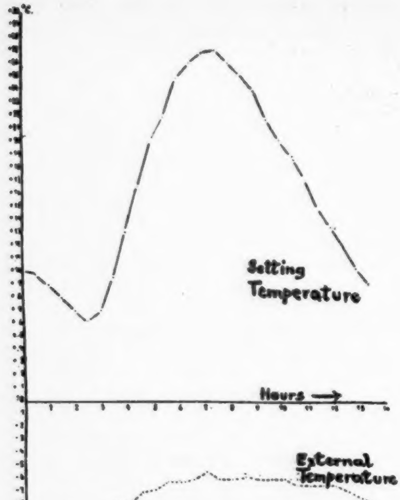


Fig 28

These difficulties, especially with facings, are not at all related to any deficiency in constancy of volume, for as we shall see further on aluminate cement is perfectly constant in volume, but depends on the hardening accompanied by a rise in temperature much greater than that occurring with portland cement; so that there is a greater expansion and a subsequent greater contraction. It can be counteracted by making the facing mortar leaner in cement down to a point which is determined by the impermeability to water. Experiments on this point will be published later.

It may be noted at this point that aluminate cement, except for the action of carbonic acid previously mentioned seems to be very insensitive to influences which might interfere with setting. In a test water saturated with ordinary salt was used instead of pure water for mixing a batch and no difficulties arose although solid lumps of salt were imbedded in the shape produced. It set perfectly and covered up the lumps of salt completely.

4. Constancy of Volume. Aluminate cement is perfectly constant in volume. The standard specifications (28 day exposure to water and air of a glass plate cake without showing any warping or cracks) are met perfectly by it as well as the cooking and heating tests. Also the very strenuous Le-Chatelier test in which a brass cylinder cut open along its

TABLE XIII

Block 30x30x30 cm., stamped down by hand, kept in the form and covered. 1 Alca : 3 standard sand

Time	Outside Temperature	Temperature at Center of block
8:00	−8.0°C.	+10.0
8:30	−8.8	+ 9.8
9:00	−9.0	+ 9.0
9:30	−8.2	+ 8.0
10:00	−9.0	+ 7.0
10.30	−8.8	+ 6.2
11:00	−8.3	+ 7.0
11:30	−8.0	+ 9.5
12:00	−8.0	+13.0
12:30	−7.0	+16.5
1:00	−6.8	+20.0
1:30	−6.2	+21.8
2:00	−6.2	+24.8
2:30	−6.0	+26.0
3:00	−5.4	+26.8
3:30	−6.0	+27.0
4:00	−6.0	+26.0
4:30	−5.8	+25.0
5:00	−6.0	+23.8
5:30	−6.0	+21.6
6:00	−6.0	+20.0
6:30	−6.5	+18.8
7:00	−6.5	+17.0
7:30	−6.5	+14.8
8:00	−6.5	+13.3
8:30	−7.0	+13.0
9:30	−7.5	+10.2
10:00	−8.0	+ 9.0

length and having a point at each side of the slit is filled with cement, exposed under cold water for 24 hours and then boiled in water for 5 hours shows a spreading of the points of only 2 mm (5 mm spread is permitted for "constant volume").

5. Gradual Setting. The view often expressed that aluminate cement is rapid setting is completely erroneous; on the contrary great value is put on the fact that aluminate cement like portland cement is slow setting. On the other hand it may justly be called "quick hardening." Aluminate cement of the correct composition sets under normal conditions in 3 to 7 hours which is of great importance in using it. It has the property of absorbing a small part of the water immediately after mixing and assuming a dull appearance, but the end of the setting period is reached only after several hours. This penomenon becomes evident if too little water for slaking is added, but in cases where the proper amount of water is added normal setting times result. In general water must be given more generously to aluminate cement than to portland cement.

As aluminate cement is wet with more difficulty than portland cement, the greatest care must be taken to assure a thorough mixing and kneading of the mortar. Wherever it is possible and convenient for the construction operations, the mortar should first be mixed dry and the water added in several portions to insure thorough moistening of the individual cement particles on kneading the mass. Under all circumstances care must be taken to avoid mixing aluminate cement with any other kind of cement as over-quick setting cements result and the strength values are very low. These quick setting cements are due to the formation of highly basic calcium aluminates. W. Dyckerhoff (Zement 1924, vol. 13, page 387) gives the following Table XIV on mixture of aluminate cement and portland cement.

6. Permanency in Storage. On the basis of the results so far obtained aluminate cement may be considered as standing up well on storage. On storage in sacks for a long time small lumps appear as a result of the pressure, but these break up between the fingers on slight pressure and show no diminution of setting power. Even on storing a sack of cement in a moist cellar for a year it was found that after the removal of a superficial crust which had formed, the remainder had retained its full cementing power and gave normal strength values.

C. Practical Construction Work. Numerous experiences on construction work in France with aluminate cements are available which have been reported in the German technical press (Gassner, Zement 1924, vol. 13, pages 415 and 591; 1925 vol. 14, page 293). In the opinion of French engineers aluminate cement is an absolute necessity in highway costruction as traffic is interrupted for only a short time as a result of the rapid hardening. The same is true of street railway foundation. Similarly aluminate cement has found favor in ferro-concrete work for roofing and covering work. Also its resistance to certain chemical influences has opened up to it a new field of application in the chemical industry for conduits, etc., and as a material for floors and passageways. Thus in a sugar refinery at Paris aluminate cement is used altogether for such purposes and after a year in service no trace of any corrosion is evident. Its use for foundations is indicated wherever either in the soil or in the ground water corrosive salt solutions may be present. The chemical resistance of aluminate cement was utilized in France in the construction of a railway tunnel passing through rocks infiltrated by water of high sulfate content, in which all other kinds of cement had proved useless. In Germany aluminate cement has been used on a large scale to line a brown coal shaft by the Gewerschaft Wolf in Cable a. S. The shaft, 90 meters deep was sunk by the freezing process. The aluminate cement set perfectly in the freezing mixture, and proved perfectly satisfactory when poured afterwards to form the shaft body in spite of the inflow of corrosive waters (Wylecol, previously quoted). A further application of aluminate cement was in the repair of a railway bridge across the Schelde valley at Wetzlar in which the rail supports had to be improved. In order not to have to stop traffic for weeks the work was so arranged that in the evening after the passage of the last train a stretch of a few meters of rails was cleared and the repair work done with aluminate cement. Next morning this section was available for traffic.

The use of aluminate cement is very advantageous also in all cases where necessity demands immediate use. Thus at the Gewerkschaft Wolf a faulty foundation for a transformer of 150 h.p. running at 1450 r.p.m., providing current for the only service machine had to be replaced without interfering with operations more than was unavoidable. It was built of aluminate cement; 24 hours after the pouring, the machine was in operation. In the same works a shaft ventilator was set going hardly after 12 hours after the pouring and has since run without interruption.

D. Costs. As appears from what we have said, aluminate cement not only equals all cements previously available, but excels them in important respects. Nevertheless its intro-

TABLE XIV

Portland Cement	Alca Cement	Standard Sand	Setting Time in Minutes Start	Finish	Compression Strengths kg/cm² 24 hours moist box	2 days' water
1.0	0	3	120	230	192	296
0.9	0.1	3	20	40	111	200
0.8	0.2	3	3	11	56	96
0.5	0.5	3	...	5	30	24
0.2	0.8	3	...	1	...	...
0.1	0.9	3	1	35	440	455
0	1.0	3	180	225	460	470

duction into German industry has been slow and hesitating in contradistinction to French practice due to the fact that the portland cement industry in Germany is more advanced in Germany than in France and has been able to provide a satisfactory structural material by the production of a high-grade special portland cement, and secondly due to the fact that the price of aluminate cement has been more than double that of portland cement. This high price results from the fact that the chief raw material is bauxite, which occurs in Germany only in small unproductive deposits process is still relatively costly. Nevertheless there are certain conditions in which it is possible for aluminate cement to compete with other cement.

As a result of the rapid hardening it is possible after 1 or 2 days, depending on the mixture, to remove the forms. This results in an appreciable decrease in the time necessary for construction and an enormous saving in the cost of forms With proper organization it is possible to get along with only one set of forms. Every construction engineer knows what values are tied up in forms when other cement is used. These advantages, even if not to so full an extent, hold true for high-grade special portland cement, but the main point is that aluminate cement has this advantage in addition to its other advantages.

The cost factor enters the situation most vigorously in practically all cases where chemical corrosion may be expected. Even in cases where aluminate cement is also attacked as, for instance, by free acids, it is always advantageous to use it instead of portland cement as the corrosion is much slower and thereby wages for repair work and for the inevitable stoppage of operations are saved. The sums involved may be estimated from the fact that reports of the Badische Anilin — and Soda-Fabrik show that repairs to their concrete work necessitated by chemical corrosion amount to about $240,000 per year.

The strongest cost factor in favor of the use of aluminate cement is found in the fact that such lean mixtures can be produced with it. If this fact is kept constantly in mind it will be found that the actual cost of aluminate cement does not much exceed that for portland cement and it can even be conservatively stated that on exact calculation taking into account all the savings effected by the use of aluminate cement, a structure built with it costs no more than it would with portland cement.

Allis-Chalmers Booklet

Something of interest is expected in an Allis-Chalmers booklet and the latest publication by that firm "Modern Rock Crushing Plants" is no exception. This 70 page booklet is printed and bound for rough usage and will be able to withstand the rigorous treatment it is apt to receive on a quarry superintendent's desk and come back ready to offer him more ideas for the improvement of his plant.

The work is well balanced taking in most of the principal machinery of a crushed stone operation, crushers, screens, elevators, conveyors, bin gates, hoists, crawls, trolleys and chain blocks.

Probably the most valuable thing in the book to the operator is the 30 page section of plant designs and illustrations. These are photographs and copies of blue print of the lay outs of typical plants. These are not theoretical operations but actual producing plants each typical of its class.

Although plants can be classed under general heads it is a well known fact that in no two cases are conditions identical. The layouts show the methods used in solving some of the many construction problems. One of the vital problems is the arrangement of machinery and the use of appliances which will reduce the labor required to a minimum.

The problem of what kind of power to use is another which must be given careful consideration as well as initial expense, location and surroundings and the length of haul. On all these points the company has had years of experience in designing plants of vastly different size, capacity and purpose.

Half of the book is devoted to illustrated descriptions of Allis-Chalmers equipment. The various crushers gyratory, Fairmount and jaw made by the company are thoroughly described and discussed.

There is much worth while material in the section on screening and a diagram showing the percentages of various sizes of stone produced when the crusher is set to give 85 per cent through given size holes in a screen.

New Bellefonte Lime Company Expanding Its Operations

BELLEFONTE, Pennsylvania, is famed as a lime center. It is noted both for the quality of the product and the number and size of its plants. The Valley View Lime Company with its works located at Hunters Park, five miles from the center of Bellefonte, is the latest addition to the many lime operations in this vicinity. This company is working on the leading seam of Pennsylvania's high calcium lime stone known to the trade as the "Trenton seam." This seam runs East and West and is 70 feet wide, and to date the depth has never been determined. Although this company is operating only on a 90 foot face others have gone to a depth of 425 feet. In this operation there is available one-half mile of this high calcium stone, which will average 98 per cent $CaCO_3$ and less than 1 per cent silica, iron and alumina and magnesia.

The Valley View Lime Company is owned by two brothers, Wilfrid I. Miller and Martin J. Miller, whose whole business life has been spent in the operation of limestone quarries. The operation was started in October, 1918, the quarry being opened from the south side. Finding that there would be enormous quantity of overburden to be removed, the Miller brothers overcame this expense by driving a 300 foot tunnel through solid rock; at that point a cut of 90 feet to the top was made. During the summer of 1919 the first steam shovel ever used in the lime stone industry in Bellefonte was delivered to them, an Osgood "18" ¾ yard shovel being the selection. This shovel is used both for stripping and loading stone on quarry cars. A Sullivan air compressor and both Sullivan and Wood drills are used. The quarry is connected with the loading chutes and kilns by about 1,600 feet of 36 inch gauge track. These chutes are used for loading furnace stone to railroad cars, the stone being hauled from the quarry in cars of their own design, by gasoline motor. Two kilns are in use burning only the highest grade of calcium lime. Coal and wood is used for burning. The kilns are of their own design, and consume about 1.8 tons of coal per 24 hours with an output of 7½ to 8 tons of lime.

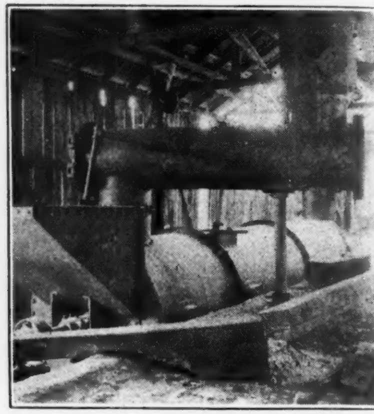
A hydrating plant is in the process of construction. The product from this plant will carry the trade name of "Buffalo Run Brand" and it is expected it will be on the market by July 1. A Schulthess hydrator was selected for the new venture. Pebble lime will also be manufactured and storage bins from 150 to 200 tons capacity are being constructed, as well as extra buildings. Elevators and conveyors will be furnished by the Gifford Wood Company.

Plans have been drawn for a stone crushing plant with a Gates crusher and the concrete bins and foundations

Loading Chutes and Stone Crushing Plant Partly Finished.

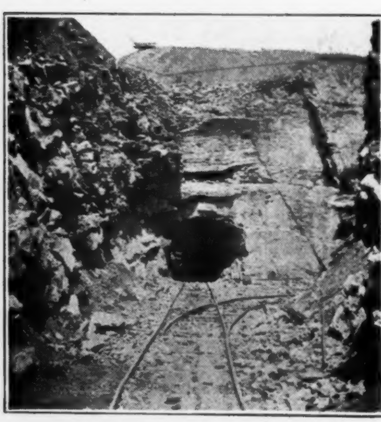
Kilns and Hydrating Plant Now Under Construction.

Face of Quarry at End of 300 Foot Tunnel.



Hydrator Being Installed.

Steam Shovel Stripping 90 Feet Above Working Level.



Entrance to Tunnel; At Right, Switch to Blast Furnace Quarry.

have been completed. The company has opened up for operation a blast furnace stone quarry, which also probably will have its product on the market within another month.

They also have a very liberal quantity of high magnesia limestone which they contemplate opening up later in the summer when the present improvements have been completed.

The entire plant will be operated by oil and gasoline exclusively. The product of this company was first placed on the market during the Fall of 1921. Since that time it has been in constant operation. The company has found a steady demand for its various productions.

Bristol's Tachometers

Bristol's electric tachometers are made for the recording and indicating the speed of rotation of every piece of revolving machinery. Their use is constantly increasing in the non-metallic field. The equipment for this accomplishment consists of a magneto and the instrument, which is a voltmeter.

The magneto is driven from the machine, the speed of which is to be measured and generates a votlage directly proportional to the speed of the machine. The voltemeter instrument is connected to the magneto by a wire lead and is calibrated to read in revolutions per minute, feet per minute, etc.

The electric type of tachometer has much to recommend it. It is inherently accurate and its accuracy does not change with use.

Concerning Lime Research

By A. S. Deringer

SCIENCE and the inventive genius of man have done much to bring the manufacture of lime from its crude early stage to the present day method, notwithstanding the fact that the evolutionary process in the lime industry has been slow, so slow in fact that it is almost imperceptible to any one generation.

Since progress in this field has been slow, the various stages have come about only as the inventive genius of man was able to meet the demands that were created.

From the early pot type of lime kiln, the industry went to the shaft kiln, in order to supply the ever increasing demand for this commodity. As time went on, even the shaft kiln was improved until we have our present day type of lime kiln, with the other improved necessary equipment, to produce the kind of product to meet the needs that were created in the process of evolution.

But since these new demands were created and supplied, and because the lime industry has enjoyed some very prosperous seasons in meeting the rather sumptuous demand, it has lain back in sort of self-satisfied attitude, and not arisen to meet the new and ever increasing demands that are daily being made for new and more improved building material. Since these demands and needs are inevitable and natural, in harmony with the laws of progress, we must arise to meet them if we want to retain our place in the commercial activities of the building material industry. A man prominent in the stone industry told me last summer that we lime producers should be ashamed of ourselves for letting a business which we created get away from us, because we were indifferent to the aggressiveness of the producers of substitute products.

Since science and the inventive genius of man have worked hand in hand to bring about an industry, as we have it today, and which we trust will continue, it is necessary that we call into action the resources of both these elements to aid in providing means and methods of manufacture that will not only produce a greater volume but at the same time produce a more economical and a superior product.

The question now naturally suggests itself. Will this solve our problem? It will to the extent that it will enable us to have a product that is superior to anything we now have, and economical enough to convert into a yet-to-be-discovered product that will have an equal competitive value with substitute products.

Your next question will be, What sort of a product do I suggest or refer to? I have a vague but indefinite idea. I know that the producers of substitutes that are fast becoming recognized as equal to and some even claim superiority over lime, are sparing neither time or expense to develop and improve their products. Some say substitutes will never entirely displace lime in the building trades. As to that, time and the attitude of lime producers to endeavor to combat the substitute materials alone can tell. If some one had ventured the prediction a decade ago that there would be substitutes for lime, there would have been a commission appointed to pass on his sanity.

Now this fact will have to be conceded, that the substitute products industry is yet in its infancy, and I dare say that within another decade the improvements in the production of these products will be very pronounced; in fact, so much so that they will make still greater inroads on lime if they do not displace it entirely, unless lime producers awaken to the fact that their industry is doomed; unless they resort to means that will enable them to compete on an equal basis with substitutes. We must all bear in mind the convenience and ease in applying these materials, which appeals to the builder.

We see in the trade magazines serving the lime and kindred industries advertisements and articles by engineers and builders of plants and equipment regarding the relative merits of their particular plants and equipment. Now while this is perfectly fit and proper for any one to cry out his wares, I think the need is not so much for lime plants or new equipment along the same lines as we have them today, but along more modern and more improved lines, that will enable us to meet the present day needs and demands, that will place us on a new plane of action and enable us to cope with present day existing conditions, and assure us in a measure the continuity of the prosperity we have enjoyed.

Some of us who confine all our efforts to producing lime only for the chemical industries, and those whose product goes to serve some one specific industry, will ask how can substitute products come in and take the place of lime. I am no chemist. I do not know. But let us not be narrow. How much of the lime produced today is used for purposes other than building? Whatever that percentage may be, what is to become of the building lime?

If the lime producers of today were as aggressive as are the manufacturers of substitutes and prepared to battle like with like, there would be no need for this discussion. But since the opposite is true, it is time we began to agitate this subject, and prepare to meet the opposition at every turn, or we will find ourselves all dolled up with expensive plants and equipment and have no place to go.

Lime Association Bulletin

Favorable results have marked the use of lime in practically all concrete work. The use of comparatively large quantities in the manufacture of concrete blocks and other products, is the latest development. This is described in "Putting Quality Into Concrete Products," bulletin 315 of the National Lime Association.

Improved appearance, increased strength, reduced absorption of water, lower permeability, and decreased penetration of dampness are some of the definite improvements noted which more than justify the title of the new booklet. The data presented are based on extensive tests conducted at the government laboratories at Rock Island, Illinois, and which were presented at the last meeting of the American Concrete Institute.

"Putting Quality Into Concrete Products," is an attractively arranged 16-page booklet, written in easy style, well illustrated and bound in a handsome two-color poster cover. Copies will be sent free on request to the National Lime Association at 918 G Street, N. W., Washington, Central Division, 844 Rush Street, Chicago, Illinois, or to any member of the Association.

The Galion Mono-Veyor

The use of mechanical handling equipment for such materials as sand, gravel, crushed stone, and other loose building materials is rapidly becoming general. A variety of equipment has been devised and used with success for various parts of the work.

Where material is to be transferred directly from hopper bottom cars to trucks, a belt conveyor or skip hoist unloader can be used to advantage. Where material is to be unloaded into storage bins beside the track or not far away, with breakage from dropping for some distance a relatively unimportant consideration, a larger skip hoist can be used to excellent advantage. Belt conveyors and skip hoists in various sizes have been manufactured by The Galion Iron Works and Manufacturing Company for many years, and for many uses this equipment is very satisfactory, where storage space is not immediately beside the track and where breakage through dropping for a considerable distance is a very real objection, especially so in the handling of coal.

A combination skip hoist and trolley system was devised by them and is giving satisfactory service in many coal yards. The announcement of a radically different and improved Galion system has just been made. This new system is of the monorail conveyor type, the name being shortened to "Mono-Veyor."

The essentials of the system are a chute under the track into which a bucket is lowered to be filled from the car by the action of gravity. The bucket is then raised by a hoist of simple, practical design to a trolley, carried to the proper bin and then lowered into the bin, onto the stock pile, or on occasion, to a truck. A trigger on the bottom of the bucket causes it to open on contact depositing its contents, with no chance of breakage. The bucket is so balanced that when it is lifted free of the material it closes and locks automatically.

The operation of the Mono-Veyor is carried out by a specially designed electric hoist which is controlled by only two levers and which is so simple in its operation that an experienced hoist operator is unnecessary. The flexibility of the system is such that it can be adapted to a wide variety of yard layouts.

Patented Process of Treating Lime and Products Derived Therefrom

PATENT number 1,583,759 was granted May 4th to Frank C. Mathers of Bloomington, Indiana, for new processes of treating lime and the derived products.

The invention relates to the treatment of lime, more particularly it relates to the treatment of lime to regulate the settling properties of the hydrate. The patent was assigned to the National Association. In the application for the patent the inventor makes the following claims for his discovery:

"In some industries, for example in the making of paper, a milk of lime is required which settles rapidly," the application says. "In others, a slow settling lime is needed. In the manufacture of whitewash, the latter property is essential. Several factors greatly influence the rate of settling, some increasing and others decreasing it. I have found that the rate of settling may be regulated by using the proper conditions as will be understood by reference to the following specification.

"Kohlschutter and Walther, Z. f. Electrochemie, vol. 25, page 159, and succeeding pages, give the results of experiments upon the settling of limes. Their experiments in general consisted in slaking quicklime with an aqueous solution of varying concentration of an organic or inorganic compound, to produce a wet hydrate.

"Among the concentrations used were normal, one-half normal and one-fourth normal solutions. Their experiments in general consisted in treating 0.5 gram of quicklime with 10 c.c. of the slacking solution. A normal solution of the slaking liquid, contained an amount of salt equivalent to the lime. When solutions of these concentrations are used containing for example, either calcium chloride, oxalic acid or sodium carbonate, the reaction of the same with the lime probably results in the production as a reaction-product of calcium oxychloride, calcium oxalate or calcium carbonate and therefore the rate of settling of these substances is tested instead of lime. Using more dilute slaking solutions, the corresponding product is a mixture of lime and the reaction-products. In their experiments an excess of water was used with the resultant production of wet hydrates which settled slowly, even when dilute solutions of the chemical compounds were used. They employed lime made by heating pure calcium oxalate, calcium carbonate or calcium hydroxide. Although normal, one-half normal and one-fourth normal solutions of the alkaline-earth chlorides, for example, calcium chloride, gave faster settling than pure water, the rate of settling does not anywhere near approximate that obtained by my process. The less concentrated solutions gave a slower settling than that occurring when usepure water. The use of the more concentrated slaking solutions is not practical for commercial work. The use of dilute solutions, according to these investigations result in a slower settling rate. These conclusions were reached because the investigators were experimenting relative to the settling power of hydrates slaked with an excess of water to a wet condition and not with hydrates slaked to a substantially dry powder. When quicklime is slaked with a limited amount of water, a dry hydrate is produced. The amount of water is that chemically necessary to hydrate the lime and compensate for the usual evaporation losses. If an excess of water is used, a wet hydrate results. I have found that a relatively fast settling hydrate may be produced by slaking to a dry hydrate with a slaking medium, preferably an aqueous slaking solution, containing a small proportion of a settling accelerator, preferably an alkaline-earth chloride, for example, calcium chloride. However, it is to be distinctly understood that this is only the preferred group of substances since it gives the most favorable results. Other substances, which while effective, give slightly less favorable results are barium chloride, sodium chloride, aluminum nitrate, etc. It is usually desired to concomitantly with fast settling produce a hydrate which settles to the smallest volume in the shortest time and my invention in its preferred embodiment includes this feature. In order that my invention may be clearly understood, the data upon which it is based is set forth under appropriate titles.

Method of Experiment

"The rate of settling was determined as follows: Ten grams of the hydrate were placed in a tall 100 c.c. graduated cylinder having an internal diameter of 23 mm. and 75 cc. of water was added. The cylinder was shaken until the hydrate was in complete suspension, and water was added to a total of 100 cc. The cylinder was again shaken until uniform mixing was obtained, and was then allowed to stand quietly. The top of the lime suspension was read at regular intervals.

"In stating the settling results it is necessary that the tables include final volume. A lime may settle rapidly for a short time and show a high settling rate. However the final volume may be large and the lime would therefore not be a "good settling" lime. Therefore it is necessary to examine the entire settling table in order to determine the lime that settles to the smallest volume in the shortest time.

"The analyses of the limes hereinafter referred to by number are as follows:

Sample No.	5	38	52	63	71	107	111
Calcium oxide	High Calcium	98.34	Magnesium Lime	High Calcium	57.55	94.92	60.02
Magnesium oxide ...		.82			39.66	1.70	39.50
Silica		.48			.36	1.50	.25
Iron and Alumina...		.29			.62	.94	.23
Loss and undetermined					.85		

Effect of Slaking to a Dry Hydrate and to a Wet Hydrate

"A quicklime slaked to a dry hydrate settles at a greater rate than if it had been slaked to a wet hydrate with excess water and never allowed to dry. For example a portion ground to 40 mesh and weighing 8.25 grams (a quantity equivalent to 10 grams of hydrate), of each of the quicklimes numbers 5, 63, 38 and 111 was slaked to dry hydrates. This was done by placing the quicklime in beakers in an oil bath heated to 110° C. (230° F.). Then 8 cc. of water was added to each and thoroughly stirred. After the slaking was completed, the beakers containing the hydrates were left in the hot bath until the hydrates were completely dry.

"Next, 8.25 grams samples of the same quicklimes were slaked to wet hydrates by addition to 50 cc. of warm water. Readings of the settling rates were made every five minutes, but the tables here give only the readings after 5, 15, 30, 60 and 120 minutes, and the final, after 24 hours. Using a 100 c.c. graduated cylinder, as stated, the number under the time headings indicate how far the precipitate has settled in a given time. For example, considering example No. 5, after 5 minutes, the lime of demarcation between the solid matter and the liquid was at 97 c.c. The following results were obtained:

Table I

Wet Hydrates (Slaked Excess of Hot Water)

Sample No.	5 min. c.c.	15 min. c.c.	30 min. c.c.	60 min. c.c.	120 min. c.c.	24 hrs. c.c.
5	97	91	82	57	50	40
63	96	89	78	50	42	39
38	96	87	75	45	34	34
111	97	90	82	57	48	38

Slaked to Dry Hydrate

Sample No.	5 min. c.c.	15 min. c.c.	30 min. c.c.	60 min. c.c.	120 min. c.c.	24 hrs. c.c.
5	92	75	56	32	32	32
63	83	55	35	29	29	29
38	86	63	40	25	25	25
111	86	64	42	26	26	26

The Effect of Temperature of the Quicklime at the Time of Slacking in Excess Water

"A hydrate was produced by dropping 8.25 grams of quicklime No. 5, heated to redness into 50 c.c. of boiling water (see No. 1, Table II). Another portion of the cold quicklime was added to 50 c.c. cold water. The temperature was 30° C. (86° F.) at the end of slaking (No. 2). Another portion of red hot quicklime was dropped into 50 c.c. of water and ice at 0° C. (32° F.) in a vessel which was packed in snow and salt. After slaking the water was at a temperature of 5° C. (41° F.) (No. 3). The results are:

Table II

Sample No.	5 min. c.c.	15 min. c.c.	30 min. c.c.	60 min. c.c.	120 min. c.c.	24 hrs. c.c.
No. 1	93	84	71	54	32	32
No. 2	97	91	82	58	50	40
No. 3	97	94	85	65	55	38

"This shows that the lower the temperature at which slaking occurs, the slower will the hydrate produced settle. This may be due to the fact that the hydrate produced at the lower temperatures contains more water. A possible formula is $Ca(OH)_2 . XH_2O$ where X is greater the lower the temperature at which this reaction takes place. This would also explain why the "dry hydrates" settled so much faster than the wet hydrates formed with excess water. The dry hydrates produced were heated to 110° C. (230° F.), and this probably drove off all the excess water. Any water incorporated in the "wet hydrate" would remain and would make the hydrate settle more slowly. The slowness of settling may not be due to slowness of slaking since in No. 3 the hot quicklime seemed to slake nearly instantly but settled the most slowly.

The Effect of Using Dilute Solutions of Chemicals in Slaking

"Ten grams of the quicklime were ground to 40 mesh, and thereafter slaked with 10 c.c. of the solution (equal weights of lime and solution).

Table III

Lime Used Equal weights of the following solutions	Min. 5	Min. 10	Min. 20	Min. 30	Min. 45	Min. 60	Min. 75	Min. 120	Final volume
38 High Calcium									
Pure water	93	96	74	63	50	42	34	29	29
1% sugar	95	90	82	74	63	57	48	40	40
1% calcium chloride	72	46	29	22	22	22	22	22	22
1% aluminum nitrate	89	78	57	40	32	25	25	25	25
Commercial hydrate	86	73	53	40	28	25	24	24	24
5 High Calcium									
Pure water	92	83	68	56	43	32	30	30	30
1% sugar	94	89	76	64	52	49	40	38	38
1% calcium chloride	80	66	44	30	26	26	26	26	26
1% aluminum nitrate	88	78	63	48	32	28	28	28	28
Commercial hydrate	Not available								
107 Dolomite									
Pure water	88	76	55	41	32	31	31	31	31
1% sugar	89	78	59	56	56	56	56	56	56
1% calcium chloride	83	66	40	28	25	25	25	25	25
1% aluminum nitrate	88	66	42	29	27	27	27	27	27
Commercial hydrate	90	80	62	49	35	28	28	28	28
71 Dolomite									
Pure water	75	40	32	28	25	24	24	24	24
1% sugar	94	88	78	65	51	40	35	27	27
1% calcium chloride	55	28	23	22	22	22	22	22	22
1% aluminum nitrate	75	38	26	23	22	22	22	22	22
Commercial hydrate	86	75	61	47	34	31	31	31	31

The beaker containing the lime was kept at 110° in an oil bath during the slaking, and until the hydrate was dry. Ten grams of this hydrate after sieving through 80 mesh was taken for each experiment. Generally, the hydrates were easily shaken through the sieve without grinding or rubbing. The two factors of interest here are the rate of settling and the total final volume of the suspension. The amount of settling varies as much as did the rate of settling. Table III shows: 1st, the limes slaked with the one per cent sugar solution had the largest final volume except in case of No. 71, where the commercial hydrate 71-A had the largest final volume. 2nd, in all cases except one, the sugar gave the lowest rate of settling and here the settling was rapid for a short time while the total volume settled was very little. 3rd, the limes slaked with calcium chloride settled fastest and also had the smallest volume in all cases. 4th, aluminum nitrate acted in the same way as calcium chloride except to a less degree. 5th, there was a large difference between the rate of settling of the commercial hydrates and of the hydrates slaked with pure water under the conditions of slaking used. In these experiments, limes 71 and 111 are solomites but in settling they act similarly to the high calcium limes, when chemical solutions are used. This indicates that chemical solutions have the same effect upon dolomite limes as they do on high calcium limes.

"Other chemical solutions have an effect upon settling as is shown in Table IV. The samples were slaked and dried in an oil bath at 125° C. (257° F.). The slaking was done by adding 10 c.c. of the one per cent solutions named on 10 grams of quicklime 63.

Effect of Chemical Solutions Upon Already Formed Lime Hydrates

"Adding solutions of chemicals to a milk of lime has very little influence upon its rate of settling. The rate of settling may be increased or decreased to a slight extent but the amount of chemical agent necessary to bring about this change is too great to warrant its use. Small amounts of chemicals have little effect while larger amounts have a greater effect. The chemicals which have the greatest effect on settling in this case are different from the ones used in slaking, and it seems that the ones added to the milk of lime suspension must react chemically with it in order to change its rate of settling. A large number of these experiments was tried out, only the following using lime No. 63 need be given since they are typical.

"Since ten grams of hydrate lime was used in each of these tests, it is seen that one gram of chemical substance is equivalent to ten per cent by weight of the lime used. It is apparent that this treatment would be impractical on a commercial scale. Smaller quantities of the chemicals showed no noticeable action. From the table it is to be noted that the hydrochloric acid increases the rate of settling while sulphuric acid decreases it. The sugar and oxalic acid have less effect than the others, but they increase the settling to a very slight extent.

"From a review of the above, it is clear that the simplest and best manner of designating the settling power of limes is to compare the volume of the lime-suspension at the end of different time-periods. Thirty minutes forms for fast settling limes a satisfactory time-period. It appears from

Table IV

Slaking agent	5 min.	15 min.	30 min.	60 min.	120 min.	24 hrs.
Blank	72	48	45	43	43	43
Sodium carbonate	93	76	57	46	46	46
Barium chloride	69	33	33	33	33	33
Borax	88	60	58	58	58	58
Table salt	68	56	54	54	54	54
Sodium acetate	88	59	42	37	37	37
Rochelle salt	85	52	52	52	52	52

Table V

Time in minutes	5 min.	15 min.	30 min.	60 min.	120 min.	24 hrs.
Nothing added	91	76	53	29	27	27
1 gram hydrochloric acid added	85	64	42	29	29	29
1 gram sulphuric acid added	97	97	64	49	31	31
1 gram sugar added	91	73	49	29	27	27
1 gram oxalic acid	89	71	48	28	28	28

a consideration of the experimental results that when dry lime hydrate prepared as set forth is mixed with water in the proportion of 10 grams to a total volume of 100 c.c. in a container having an internal diameter of 23 mm. the line of demarcation between the clear and clouded parts of the fluid is approximately at less than thirty centimeters at the end of thirty minutes. Specifically, it appears that the line of demarcation varies between 22 and 30 c.c. considering the 30 and 60 minute time-periods.

"I claim:

1. A milk of lime suspension containing a fast settling lime hydrate, said hydrate being characterized by the property of settling quicker than that prepared by slaking with an excess of water.

2. A milk of lime suspension containing a fast settling lime hydrate, said hydrate being prepared by slaking lime to a dry hydrate in the presence of settling accelerator.

3. A milk of lime suspension containing a fast settling hydrate, said hydrate being prepared by slaking lime to a dry hydrate in the presence of an aqueous solution of alkaline earth chlorid.

4. A milk of lime suspension containing a fast settling hydrate, said hydrate being prepared by slaking lime to a dry hydrate in the presence of an equal weight of 1 per cent solution calcium chlorid.

5. A milk of lime suspension containing a fast settling hydrate, said hydrate being prepared by slaking lime to a dry hydrate in the presence of an equal weight of 1 per cent solution of an alkaline earth chlorid.

6. The herein described milk of lime suspension containing a rapid settling hydrate of lime distinguished by the fact that when the hydrate is mixed with water in the proportion of 10 grams to a volume of 100 c.c. in a container having an internal diameter of 23 m.m., the line of demarcation between the clear and clouded parts of the fluid is at less than 30 c.c. at the end of thirty minutes.

7. The herein described milk of lime suspension containing a rapid settling hydrate of lime distinguished by the fact that when the hydrate is mixed with water in the proportion of 10 grams to a volume of 100 c.c. in a container having an internal diameter of 22 mm., the line of demarcation between the clear and the clouded fluid is approximately between 22 and 30 c.c. at the end of 30 minutes.

8. The herein described milk of lime suspension containing a rapid settling hydrate of lime distinguished by the fact that when the hydrate is mixed with water in the proportion of 10 grams to a volume of 100 c.c. in a container having an internal diameter of 23 mm. the line of demarcation between the clear and clouded parts of the fluid is approximately between 22 and 30 c.c. at the end of 30 minutes and below 26 c.c. at the end of 60 minutes.

9. The herein described milk of lime suspension containing a fast settling hydrate of lime distinguished by the fact that when the hydrate is mixed with water in the proportion of 10 grams to a total volume of 100 c.c. in a container having an internal diameter of 23 mm., the line of demarcation between the clear and the clouded parts of the fluid is approximately between 22 and 30 c.c. at the end of 30 minutes and approximately between 22 and 25 c.c. at the end of 60 minutes.

10. The herein described milk of lime suspension containing a lime hydrate settling rapidly to one-third of its original volume in approximately 30 minutes.

11. An aqueous lime suspension containing a rapid settling lime hydrate distinguished by the fact that when 10 grams of hydrate is present in a total volume of 100 c.c., the line of demarcation between the clear and clouded parts of the fluid is approximately between 22 and 30 c.c. at the end of thirty minutes when measured in a container having an internal diameter of 23 mm."

New Incorporations

Portland Gravel Company, Portland, Ore., capital stock increased from $65,000 to $145,000.

Ampere Lumber Co., Newark, N. J., deal in lumber, building materials, etc.; $25,000 capital. Incorporators: Charles E. Rogers, Norman S. Grobert, William Dewolf-Donan, Newark, N. J. (Atty. E. R. McGlynn, Newark, N. J.)

Sasso Art Cement Co., capital $5,000. Incorporators: J. Litwin, C. Tomanek. (Atty. F. X. Nazeter, 353 Fifth avenue, New York City.)

Haines Brothers Sand Block Co., Camden, N. Y., capital $125,000. Manufacture brick, stone and building materials.

Magnetic Protection

By R. H. Stearns, President, Magnetic Manufacturing Company

There appears to be a very considerable amount of activity in the cement, lime, gypsum, and crushed rock industry now and during the past few months. Our views of this activity have been formed on the basis of the amount of business placed for magnetic equipment. Our plant has been operating at peak production since the first of the year. In this fields of activity the need for insurance or protection to crushing equipment is of paramount importance, especially since modern methods are being employed in the handling of such materials. Tramp iron is perhaps one of the most serious hazards it has become necessary to contend with. The old method of stationing men at fixed positions near the crusher to remove the occasional piece of tramp iron is no longer satisfactory, as it involves too great a risk, resulting in serious smash-ups and curtailed production. Such delays have cost thousands of dollars in loss of time, to say nothing of the expense of repairs and repair parts. The progressive operator is, therefore, turning his attention to modern means and methods not only to keep his plant operating, but to improve his methods by making such changes and additions as will insure maximum results. Magnetic equipment, such as a magnetic pulley acting as the head pulley in the conveying system, is the logical solution to a very difficult problem. The magnetic pulley quite naturally appeals to the progressive operator on account of low operating cost as well as simplicity of operation and very low initial and installation cost. A few cents a day will cover the cost of electric current sufficient to provide a powerful magnetic field which will arrest from the flow of material passing over the conveyor any tramp iron and prevent its entrance into the crusher. A piece of steel or iron which may be a tool, a hammer head, or parts of broken machinery is easily concealed from the naked eye in the mass of material being conveyed to the crusher, but such material cannot escape a strong magnetic pulley. Tons and tons of such material are being removed daily in many of the modern plants and thousands of dollars are being added to the profits for the year. Magnetic equipment applicable to existing conditions, whether a magnetic pulley for a belt conveyor, safety magnet suspended over conveyor belt, a magnet to operate in steel apron conveyor or feeder, or other special conditions, makes it possible to speed up production and meet the ever increasing demand. There is hardly a problem of this nature, where modern methods are employed, where magnetic equipment in one form or another is not used.

Plant insurance such as fire, use and occupancy, etc., is deemed of utmost importance. It has, however, taken years of untiring effort to educate the user, broaden and extend a form of protection which to say the least is just as necessary; in fact, magnetic protection pays a larger return on the investment in the form of profit added to each year's earnings than any other form of insurance.

New Handbook for Wire Rope Users

How to measure wire rope, how to and how not to uncoil or unreel it, how to make an endless splice, how to properly seize rope, how to correctly socket wire rope, how to care for it when both in and out of service, are just a few of the things told in the new 88-page handbook on wire rope recently issued by the American Cable Company.

In addition to such information, there is shown by detailed drawings, the best methods for making equalizing slings, bridle slings, and other miscellaneous sling and fitting equipment. There also appear briefened, though complete, treatises on wire rope lubrications, the effect of heat on wire rope performance, alignment, reverse bends, fleet angle, idle ropes, and other such subjects. Seldom have we seen a book that covers in a more informative way every phase of wire rope usage, application and maintenance. Not only does it give detailed information regarding the various "lays" and the varying constructions of wire rope, but much data that should prove invaluable to wire rope users.

Standard Cement Corporation (building materials), capital $10,000. New York City. (U. S. Corp. Co.)

The Central States Portland Cement Company

Announcement has recently been made through the office of The Cowham Engineering Company, 111 W. Monroe street, Chicago, Illinois, of the organization of the Central States Portland Cement Company, to build a $3,000,000 portland cement plant at La Salle, Illinois. This plant will make available to the Chicago market approximately 1,000,000 barrels of portland cement per year.

The site selected for the plant of the Central States Portland Cement Company is directly east of La Salle where the company has acquired approximately 170 acres of limestone and clay lands for the supply of the raw materials. For several months the Cowham Engineering Company has been prospecting this territory and the site selected is considered to be the last available deposit of raw materials suitable for economical portland cement manufacture in this well-known cement district.

For many years the town of La Salle has been closely associated with the manufacture of portland cement. At the present time three plants are in operation there and a plant at Dixon, Illinois, completes the Illinois production.

According to estimates by the United States Geological Survey more than 14,000,000 barrels of portland cement were consumed in the state of Illinois last year, of which it is estimated that less than 6,000,000 barrels were produced by the plants within its borders. The city of Chicago is considered one of the largest cement consuming centers in the United States and the construction of a new plant at La Salle will aid materially in supplying this market.

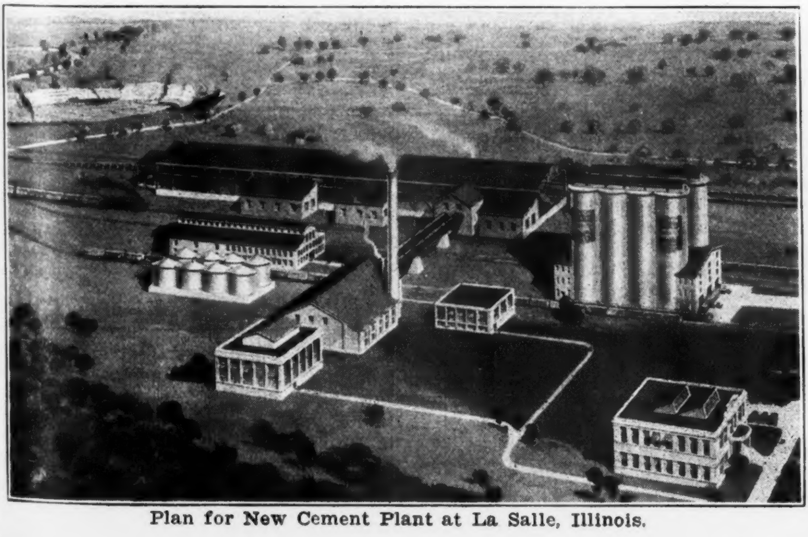
The new plant to be constructed will be along the lines developed by the Cowham Engineering Company and successfully used in other plants that have been built by this company. The plant will utilize the wet process of manufacture and will employ about 250 people.

The original plans call for the erection of a large storage building for raw materials and silos for cement storage for a capacity of 100,000 barrels.

Mr. John L. Senior will be president of the Central States Portland Cement Company and Mr. Fritz Worm of La Salle, Mr. R. A. Drum of Chicago, and Mr. H. J. Weeks of Cattanooga, Tenn., vice-presidents.

The construction of the plant of the Central States Portland Cement Company is the third new plant to be announced by the Cowman Engineering Company within recent months. Construction has already started on a $5,000,000 portland cement plant for the Florida Portland Cement Company at Tampa, and announcement was made last week to build a 1,500,000 barrels plant at Rockland, Maine.

The completion of these three plants will bring to Chicago the operation of one of the largest chain of cement plants in this country.



Plan for New Cement Plant at La Salle, Illinois.

Investigate New Use For Feldspar

INVESTIGATIONS now under way in Yancey and Mitchell Counties, North Carolina, may mean that the rich deposits of feldspar in many mines in that region will be multiplied many times in value and result in a material contribution to the solution of the difficult problem of a sufficient supply of potash for the uses of the country.

This probability is supported by two methods recently discovered for extracting the potash content of feldspar, which hitherto has not been capable of separation in a manner to justify commercial operation.

One of these experiments has been in course of development for some time at Columbia University, and laboratory results have been such as to convince the scientists who have been doing the work that the method is economically feasible. They have been working on microline, one of the varieties of feldspar common in North Carolina. Application is now pending for a patent for this process.

Another method, invented and patented by a Chicago chemist, is also reported to have had perfect success in the laboratory. This inventor and his financial backers are now seeking a deposit which will furnish 100 tons per day for use in a mill. Their requirements are that the feldspar must contain not over 65 per cent silica, high potash content (12 per cent or more), high aluminum (18 per cent), and low soda (not more than ½ to 1 per cent). Iron up to 1 to 2 per cent, it is explained, will not be considered material.

These parties have been in communication with Dr. Jasper L. Stuckey, State Geologist, with reference to North Carolina feldspar and its suitability for their purposes as outlined in the specifications. In extracting potash from feldspar the new methods contemplate the using of by-products from aluminum and iron.

At present the production of feldspar in the State averages around 100,000 tons per year which sells at a price of approximately $6 per ton. For the most part the product is sold practically in the crude state, as it comes from the mines, being shipped to users abroad, who employ it in a multitude of products, although a beginning has been made of grinding at the mines in order to secure a better price.

The effect of any extensive use of feldspar in the successful extraction of feldspar can be realized in the fact that the price of potash used in fertilizer is around $40 per ton. Under the stimulus of a potash industry in feldspar the production could be greatly increased, since it is known that feldspar in large deposits remains as yet practically untouched.

In the event of the commercial employment of the feldspar-potash methods, two states would furnish practically all of the raw material, North Carolina and Maine.

The people of the United States first realized fully their need of potash when the outbreak of the World War stopped the importation of the usual supplies, which came entirely from Germany. Desperate efforts were made by the government to induce a domestic production, these taking the form of seeking potash in by-products. It encouraged by-product cement plants, the use of kelp on the Pacific Coast and other emergency measures. But with the close of the war Germany's practical monopoly was again established, although some of the potash deposits had been taken over by France in the Alsace-Lorraine region.

Recently the U. S. Geological Survey has been seeking government investigation of reputed potash supplies in salt beds of Texas and New Mexico, but the possibilities in these sections are as yet undetermined. It is known certainly that feldspar such as that produced in North Carolina has a high potash content, but before the inventions referred to it has not been possible to extract it commercially. The inventors now say that, with the by-products which could be obtained, feldspar potash could be sold at a profit at a price which would compete with the best terms on which the German and French products could be offered.

The Standard Asbestos and Cork Company of 541 South Troost Street, has been appointed distributor for Adamant Fire Brick Cement, at Tulsa, Oklahoma. They will cooperate with users of fire brick who are interested in prolonging the life of fire brick construction, and in reducing refractories maintenance costs.

Increased Production of Fuller's Earth in 1925

Production of fuller's earth in the United States in 1925 was 206,574 short tons, valued at $2,923,965, it is announced by the Bureau of Mines, Department of Commerce, which is preparing a report on the subject, in cooperation with the Geological Surveys of Alabama, Florida, Georgia, Illinois, and Texas. This is an increase of 16 per cent in quantity and 11 per cent in value compared with 1924. These increases were due in part to the reappearance of California and Nevada as producers of fuller's earth, though every state that reported production in both 1924 and 1925 showed an increase. The output was reported by 14 operators in 7 states in 1925, namely California, Florida, Georgia, Illinois, Massachusetts, Nevada, and Texas; in 1924, production was reported by 13 operators. California and Nevada reported no production in 1924, and Alabama, which was a producer in 1924, reported none in 1925. Georgia was the leading state in production in 1925, with Florida second and Texas third, as in 1924. These three states produced 85 per cent of the total output. The average value per ton of fuller's earth was $14.15 in 1925 compared with $14.79 in 1924.

Fuller's earth is a term used to include a variety of natural substances that possess the property of absorbing grease or clarifying, bleaching, or filtering oil. They are mostly claylike substances, though recently discovered material in the West, which is of different character, is said to be superior to the eastern fuller's earth. The original use of fuller's earth was in the fulling of cloth, but little of it is now used for this purpose. It is used almost exclusively in the bleaching or filtering of vegetable and mineral oils. Until 1895, when fuller's earth was successfully produced commercially in Florida, the United States was entirely dependent on foreign supplies. The imports have on the whole been decreasing in recent years. In 1925, however, they were 8,015 short tons, valued at $111,295, an increase of 10 per cent in quantity and 20 per cent in value. Notwithstanding this increase the quantity of fuller's earth imported in 1925 was the smallest, except in 1924, since 1897.

The exports of fuller's earth are not separately shown by the Bureau of Foreign and Domestic Commerce, but 5 producers reported that in 1925 they exported 6,195 short tons of fuller's earth, which was a slight decrease from 1924.

Ruggles Carborundum Machines

Ruggles openside carborundum machines, manufactured by the Gray Foundry, Inc., size a great part of the world's slate and soapstone products. The machine has few working parts and the table travels over accurately machined ways. The table is driven by a worm thus insuring square and true cut edges on stock. It is also equipped with holes for pegging down the stock and holding it if necessary.

The machine is operated through a variable speed countershaft to the tight and loose pulleys on the feed shaft. The feed may be quickly regulated by the operator to any speed required for the various thicknesses of the stock. The feeds in the standard machine are in the ratio of 1 to 6 cutting from 5 to 6 inches per minute on thick stock and up to 36 inches per minute on thin stock.

Every consideration has been given to the elimination of working parts on account of water, wear and upkeep. The main arbor is driven by a six inch belt, placed out of reach of water, and two 2½ inch belts on the feed drive shaft out of the way of the usual amount of muck discharged by the cutting wheel.

The flexibility of this machine includes special clearance measurements for distance between the upright and the wheel as the customer may require. The standard is 2 feet 7 inches. The arbor is constructed with two 10 inch babbitted bearings.

The Tulley Equipment Company, St. Louis, Missouri, who are representatives of the Climax Engineering Company, Clinton, Iowa, have moved to their new location at 2339 Pine Street. They will have office sales and service station at the new address. The Tulley Equipment Company handle the sale of Climax "Trustworthy" engines and power units in and around St. Louis.

H. C. Elliott and Company, Inc. (deal in wood, coal, sand, gravel and stone products), H. C. Elliott, F. H. Elliott, J. G. Ridgeway and O. R. Shaffner, incorporators.

Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20 cents each. State number of patent and name of inventor when ordering.

1,581,278. Excavator. Henry McDermott, Milwaukee, Wis., assignor to McDermott Mechanical Co., Iron River, Mich.

1,581,318. Excavating machinery. Julius O. Lium, Christine, N. Dak.

1,581,492. Concrete-mixer. Adolph W. Rybeck, Milwaukee, Wis., assignor to T. L. Smith Co., sameplace.

1,581,522. Device for burning cement, magnesite, lime, etc. Harry Stehmann, Berlin-Hohenschonhausen, Germany.

1,581,684. Single roll crusher. John G. Ogden, Columbus, Ohio, assignor to Jeffrey Mfg. Co., same place.

1,581,686. Screen. Edward O'Toole, Gary, W. Va.

1,581,705. Loading-machine. Charles E. Waxbom, Columbus, Ohio, assignor to Jeffrey Mfg. Co., same place.

1,581,969. Attrition-mill. Albert W. Longaker, Chambersburg, Pa., assignor to Wolf Co., same place.

1,582,048. Concrete-mixing machine. Gerhard Jaeger, Columbus, Ohio.

1,582,273. Method of blasting and apparatus therefor. Joseph E. Joy, Pittsburgh, Pa., assignor to Joy Machines Co., same place.

1,582,312. Mining-car. Chester D. Sensenich, Irwin, Pa.

1,582,350. Mine-car. Hugh W. Sanford, Knoxville, Tenn.

1,582,357. Mortar-mixing machine. Oliver C. Talbot and Andrew Flood, Kansas City, Mo.

1,582,411. Method of and apparatus for working mines. William H. Lesser and Russell L. Suender, Frackville, Pa.

1,582,474. Automatic sand-sifter. Guss M. King, Flat Rock, N. C.

1,582,538. Pulverizing-mill. Fred I. Raymond, Evanston, Ill., assignor to Raymond Brothers Impact Pulverizer Co., Chicago, Ill.

1,582,577. Dipper-bucket. Ernest E. Crane, Minneapolis, Minn., assignor to Pettibone Mulliken Co., Chicago, Ill.

1,582,831. Cement-roasting apparatus. Ivan E. Lanhoffer, Paris, France.

1,582,949. Mining-machine. Charles E. Waxbom, Columbus, Ohio, assignor to Jeffrey Mfg. Co., same place.

1,583,318. Hoist mechanism for power loaders for mixers. Samuel Shafer, Jr., Milwaukee, Wis., assignor to Chain Belt Co., same place.

1,583,324. Pulverizing-mill. Charles Strachan, Mascot, Tenn., assignor to Strachan Tube Mill Co.

1,583,327. Excavating - machine. Daniel J. Walsh, Pittsfield, Mass.

1,583,527. Mining-machine. Isador Burton, Pittsburgh, Pa.

1,583,713. Mixing composition for use with wood aggregates and structures. James R. Garrow, London, England, assignor to Novocrete Co. of America, New York, N. Y.

1,583,759. Process of treating lime and product derived therefrom. Frank C. Mathers, Bloomington, Ind., assignor to National Lime Association, Washington, D. C.

1,582,811. Excavator. George T. Stubblebine, Buffalo, N. Y.

1,583,870. Mechanical shovel. Iestyn M. Charles, Golden, Colo.

1,583,992. Mining-machine. Edward O'Toole, Gary, W. Va.

1,584,052. Dipper-tooth. Lesher W. Van Buskirk, Clinton, N. J.

1,584,622. Feeding mechanism for crushers. Harry N. Lowenthal, Philadelphia, Pa., assignor to R. H. Beaumont Co., same place.

1,584,697. Gyratory crusher. Richard Bernhard, Allentown, Pa.

New Incorporations

Structural Gypsum Corporation, Delaware Corp., qualified to transact business in Indiana; 124 shares common, no par value, and $5,000 preferred capital stock. Installation of gypsum products; agent for service of process, Robert D. McCord, 947 Consolidated Bldg., Indianapolis, Ind.

Haines Bros. Sand Block Company, Camden, N. Y., (manufacture and deal in cement blocks, etc.) Capital $125,000. Incorporators: Wm. Haines, Royden Haines, Christina Braddock, Bertha McFerren, Gibbsboro. (Atty. Frank Voigt, Camden.)

Consolidated Asphalt Corporation, Kings County, N. Y. Capital $200,000. Incorporators: Frank T. Reiner, 324 E. 19th St., New York City; Joseph T. Keller and Anna F. Louprette.

The Standard Gypsum Co., Wilmington, Del., capital $1,000,000. (Corp. Service Co.)

Oil Electric Locomotive to Be Used in Mine

The oil-electric locomotive, the latest development in American railroading, is to make its appearance within the next six weeks in the mining field. Announcement was made today by the Ingersoll-Rand Company, joint producer, with the American Locomotive and General Electric companies, of the oil-electric, that one of the 60-ton type has been ordered by the Utah Copper Company, for use at its mines at Bingham, Utah.

The debut of the oil-electric locomotive at the Utah copper mines will mark its first invasion in mining operation anywhere in the world.

In announcing the placing of the order by the Utah Copper Company, officials of the Ingersoll-Rand Company stated that the locomotive is to be installed purely in the interest of economy of operation. Engineers of the producing companies estimate that the oil-electric will save four cents on every ton on material it hauls from the mines. This includes ore and waste rock as it is taken out.

The Utah Copper Company owns an entire mountain at Bingham and its 57 steam locomotives haul from it over 30,000,000 tons of material each year. Based upon an average of 526,- during the year, the saving effected by the oil-electric, at four cents a ton, would run to $21,052.60 on its year's work.

On this basis if oil-electric were substituted for the entire 57 steam locomotives, the saving on the 30,000,000 tons of haulage would be over $1,200,000 a year.

The oil-electric will take its place with the steam locomotives, or "saddlebacks," in working along the winding switch-back roads that girdle the mountain, hauling cars up and down, and switching the loaded ones to side-tracks, ready for the process of extracting the ore from the rough stone. Exactly the same work will be done by the oil-electric and steam locomotives. Aside from the saving in fuel, through the use of heavy grade oil, the oil-electric makes further economy possible through the elimination of round-houses, turn-tables, water towers and troughs, hostling service and the handling of coal and ash pits.

New Climax Engine Literature

The Climax Engineering Company, Clinton, Iowa, have just issued three new bulletins describing the application of Climax "Trustworthy" Engines to various types of driven units.

Bulletin E describes their Climax power units, which are designed to be connected by belt to the driven unit. Both portable and stationary types for outside and indoor service are illustrated. This bulletin lists equipment, general description of units, horsepower curves, and general information.

A second bulletin, F, describes Climax engines direct connected to generators, A very helpful table is included, showing the kilowatt range of each model of engine. The bulletin is complete with illustrations, equipment lists, horsepower curves and engineering data. Climax engines for generator sets are mounted on special supporting frames with an extended cast iron base to which the generator is bolted.

Bulletin G describes the Climax engine direct connected to centrifugal pumps. A table is also incorporated in the bulletin showing the head and capacity in gallons per minute which each model engine will handle. Like the generator bulletin, a complete description of the engine is given, with horsepower curves, lists of equipment, and other pertinent data.

New Incorporations

United Builders Supply Corporation, Worcester, Mass. (building materials), capital $50,000; incorporators, David J. Katz, Abraham Katz and Thomas J. Powers.

Rockland Cement Block Co., Clarkstown, N. Y., 100 shares common stock, no par. Incorporators: E. and J. H. Mulrain, J. C. Britton. (Attys. McKercher & Link, 40 Rector St., Manhattan.)

Logan Brick and Sand Company, Logan, W. Va., capital $25,000. Deal in fire clay, sand, gravel, cement, paving brick. Incorporators: C. R. Broom, Logan; J. F. May, Rossmore; G. F. Gore, J. P. Hager, L. C. Broom and C. S. Minter, of Logan.

Employers in every industry have written to the National Safety Council for copies of its latest leaflet, "An Industrial Safety Program to Fit Your Needs," which will be sent to any reader of this publication on request.

Westinghouse Plans Big Building Program

The present building program for the expansion of facilities at various plants and offices of the Westinghouse Electric and Manufacturing Company, will involve an expenditure of $5,525,000, according to T. P. Gaylord, acting vice president of the company.

New factory structures or office buildings are now in course of construction at East Pittsburgh, headquarters of the company and at Mansfield, Ohio, Detroit, St. Louis, East Springfield, Massachusetts, Sharon, and Derry, Pennsylvania.

The cost of the new general office building now nearing completion at the East Pittsburgh works is $1,500,000. The structure is 11 stories high, with a floor area of 165,000 square feet. This space is designed for the accommodation of 1,800 employes. The building is scheduled for completion late this summer.

Plans for the construction of a 500,000 storehouse for finished products at the Mansfield works of the company have been approved. The building of steel-brick design will be four stories high and will have a floor area of 130,000 square feet. This is the third building to be erected by Westinghouse at Mansfield since the company moved there from Flint, Michigan.

The building under construction in Detroit represents an expenditure of $400,000. The building is four stories, of concrete construction with brick exterior. It will have a floor area of 100,000 square feet. It has been designed for use as office, warehouse and service station.

The George Cutter organization of the Westinghouse interests has under construction a $300,000 building in St. Louis, Missouri. This structure will be used as a cement pole plant—a new Cutter industry. The building is one story high and will have a floor space of 38,000 square feet.

Plans have been completed for additional buildings at the East Springfield Works that will represent an outlay of approximately 475,000. The principal part of the program calls for a three-story office building. The offices of the new building will provide executive rooms for the engineering, sales, drafting and mechanical departments. The cost of this building will be $275,000.

A four-story extension to be built on the main factory will be of heavy mill-type construction. This together with other improvements, will cost in the neighborhood of $200,000.

Plans are being prepared for construction work that will entail a cost of $275,000 at Sharon. The program includes for a five-story building for light manufacturing purposes. The structure will be mill type of brick steel construction. A one-story building also will be erected for heat treating and galvanizing work.

A $75,000 office building is now under construction in Derry. The building will be two stories in height. It will be of steel brick construction.

Kempner to Direct "Lo-Hed" Hoist Sales

The American Engineering Company, of Philadelphia, announces the appointment of H. Kempner as sales manager of its "Lo-Hed" electric hoist division. Mr. Kempner has been in charge of sales promotion work for the American Engineering Company for the last three years. He studied electrical engineering at Harvard University and for four years was an instructor in physics at Pratt Institute, Brooklyn.

He formerly was connected with the engineering department of the Western Electric Company in New York. From 1919 to 1923 Mr. Kempner was in the service of the McGraw-Hill Publishing Company. In 1920 he was sent to Washington to organize and take charge of the disposal of surplus war property for the government. In this work he planned and supervised the execution of advertising campaigns that resulted in the sale of millions of dollars worth of surplus war materials of every description. Mr. Kempner holds the rank of major, in the field artillery, Officers Reserve Corps. He was overseas from 1917 to 1919.

Delaware Moulding Sand Co., Newark, N. J., capital $30,000. Charles P. Lyman, Howard D. Burrough, Plainfield, N. J., and Horace W. Wemple, Elizabeth, N. J., incorporators. (Horace R. Wemple, Newark, N. J., Atty.)

Birmingham Builders Supply Company, Birmingham, Ala., (building materials and supplies), capital $25,000. R. H. Wharton, C. F. Witichen, A. A. Findley and J. W. McKinstry, officers